

## *chapter* fifteen

# **Ireland: A review of casemix applications within the acute public hospital system**

*Jacqueline O'Reilly, Brian McCarthy  
and Miriam Wiley<sup>1</sup>*

### **15.1 Hospital services and the role of DRGs in Ireland**

#### ***15.1.1 The Irish health care system***

Health care expenditure in Ireland experienced unprecedented growth during the late 1990s, increasing by almost 80 per cent in real terms between 1997 and 2002 (Nolan, 2005; Wiley, 2005; McDaid et al., 2009). Growth in expenditure has remained strong in subsequent years and total current health expenditure was in excess of €19 billion in 2008 (McDaid et al., 2009; Brick et al., 2010). About four fifths of total (current and capital) health expenditure was publicly funded in 2007, up from three quarters in 1997 (McDaid et al., 2009; OECD, 2009; Brick et al., 2010). Private health expenditure from out-of-pocket payments and private health insurance accounted for the remainder (Brick et al., 2010). In 2007, public health expenditure accounted for 7.2 per cent of gross domestic product (GDP) (8.5 per cent of gross national product, GNP) (McDaid et al., 2009).<sup>2</sup>

This period of expenditure growth was followed by fundamental structural reform. The health system was previously organized according to a regional structure. However, this decentralized structure created tensions between national health policy objectives and local service delivery (Brennan, 2003; Prospectus, 2003; McDaid et al., 2009). Consequently, the Health Service Executive (HSE) was established in January 2005 to focus on service delivery and management at national level, while the Department of Health and Children (DoHC) was charged with devising policy and strategy, thereby effecting a separation of operation and management from policy-making. Since October

2009 the Integrated Services Directorate within the HSE oversees the primary care and acute hospital sectors – a task that was previously divided between the Primary, Community and Continuing Care Directorate and the National Hospitals Office (HSE, 2010d).

The unusual public/private interaction in Irish health care means that acute public hospitals can provide private services. Private practice within public hospitals is generally constrained to beds designated for private patients, which amount to approximately 20 per cent of all acute public hospital beds nationally.<sup>3</sup> Consultants in acute public hospitals may – depending on their employment contract – be permitted to treat private patients up to a maximum of 20–30 per cent of their complexity-adjusted workload (Brick et al., 2010). Public hospitals and consultants face different payment mechanisms for public and private patients, which have been criticized for incentivizing the treatment of private patients (Nolan & Wiley, 2000; Colombo & Tapay, 2004; Brick et al., 2010; O'Reilly & Wiley, 2010; Ruane, 2010). Given the relatively low number of private hospitals and the paucity of readily available private sector data, what follows focuses on the acute public hospital sector.<sup>4</sup>

There are three main categories of entitlement to access health care services in Ireland (see Table 15.1). Eligibility for a medical card is largely determined on the basis of income (McDaid et al., 2009).<sup>5</sup> GP visit cards are also allocated on the basis of income, with the income threshold being 50 per cent higher than that for medical card holders (Brick et al., 2010). In 2009, medical card holders and GP visit card holders comprised 33.2 per cent and 2.2 per cent of the population, respectively (DoHC, 2010a). The remainder of the population (approximately 65 per cent in 2009; Brick et al., 2010) do not qualify for a medical card or a GP visit card. About 46 per cent of the population in 2009 held supplementary private health insurance, which mainly covers acute hospital services (Brick et al., 2010). A further 5 per cent held both a medical card and private health insurance (Brick et al., 2010).

### **15.1.2 Hospital services in Ireland**

In 2010, 52 acute public hospitals provided day-case, inpatient, outpatient and emergency department (ED) services to public and private patients (Brick et al., 2010; HSE, 2010c). All of these public hospitals receive funding from the HSE on a global budget basis (McDaid et al., 2009; Brick et al., 2010). Annual global budgets are determined on an historic basis, with some adjustment for, *inter alia*, inflation, pay adjustments and one-off funding. A subset of these public hospitals (39 in 2010; HSE, 2010a) participate in the National Casemix Programme under which their global budgets are prospectively adjusted using diagnosis-related groups (DRGs) (see subsection 15.5).

In addition to funding public hospitals, the HSE also directly operates 34 acute public hospitals (Brick et al., 2010; ESRI-HRID, 2010). The remaining public hospitals are typically owned and operated by voluntary organizations (for example, religious orders) (Robbins & Lapsley, 2008; McDaid et al., 2009). A small number of acute public hospitals provide specialist services (such as maternity, paediatric and orthopaedic care). Table 15.2 provides a breakdown of

**Table 15.1** Health care charges for public and private patients

	<i>Public patient</i>		<i>Private patient</i>
	<i>Medical card holder</i>	<i>Non-medical card holder (including GP visit card holder)</i>	
GP visits	Nil	Charge determined by GP Nil for GP visit card holder	Charge determined by GP
Prescription medicines	50c charge per prescription item up to maximum of €10 per family per month <sup>a</sup>	Free above €120 out-of-pocket payment per month No charge for certain long-term illnesses/conditions	
Public hospitals			
ED	Nil	€100 unless referred by GP or subsequently admitted to hospital <sup>c</sup>	
Outpatient department	Nil	€100 unless referred by GP or subsequently admitted to hospital <sup>c</sup> No charge for repeat attendances	
Day case/ inpatient	Nil <sup>b</sup>	Daily hospital charge of €75 (up to a maximum of €750 in any 12 consecutive months) <sup>b</sup>	Daily hospital charge as per public patients plus a hospital maintenance charge and consultant fees <sup>d</sup>

Sources: Adapted from Brick et al., 2010; Citizens Information Board, 2011.

Notes: <sup>a</sup>From 1 October 2010; <sup>b</sup>Additional charges may be levied on long-stay patients; <sup>c</sup>Rates effective from 1 January 2009; <sup>d</sup>The hospital maintenance charge is a per diem charge, which varies according to the type of treatment (inpatient or day case), accommodation (private or semi-private bed) and hospital (DoHC, 2009b); For 2011, this charge ranges from €193 for day care in district hospitals to €1017 for private accommodation in certain hospitals, such as regional hospitals (Citizens Information Board, 2010).

public hospitals by their size, ownership and type and Table 15.3 reports the changes in hospital beds and activity between 2000 and 2008.<sup>6</sup>

### 15.1.3 Purpose of the DRG system

The DRG system in Ireland has a number of national applications. First, following a recommendation of the Commission on Health Funding (1989), the DRG system has been used since 1993 to adjust acute public hospitals' budgetary allocations for the complexity of their casemix and their relative performance. Second, under a renegotiated contract (effective from September 2008), the outputs of the national casemix models are used to adjust hospital consultants' day-case and inpatient activity for complexity and to take account of their involvement in each case (HSE, 2008). Third, DRG data feed into *HealthStat*, a

## 276 Diagnosis-Related Groups in Europe

**Table 15.2** Distribution of hospitals by number of beds, ownership and type, 2008

Number of beds	HSE			Public voluntary			Total (HSE and public voluntary)		
	General	Special	Total	General	Special	Total	General	Special	Total
<100	5	4	9	2	1	3	7	5	12
100–<200	5	1	6	2	4	6	7	5	12
200–<300	10	0	10	2	2	4	12	2	14
300–<400	5	0	5	0	0	0	5	0	5
400–<500	0	0	0	0	0	0	0	0	0
500–<600	3	0	3	1	0	1	4	0	4
≥600	1	0	1	4	0	4	5	0	5
<b>Total</b>	<b>29</b>	<b>5</b>	<b>34</b>	<b>11</b>	<b>7</b>	<b>18</b>	<b>40</b>	<b>12</b>	<b>52</b>

Source: Adapted from Brick et al., 2010.

Notes: Data on psychiatric beds were not available for four hospitals; Bed data relate to the average number of beds available and include both day-case and inpatient beds.

**Table 15.3** Summary of hospital activity and beds, 2000 and 2008

	2000			2008			% change 2000–2008
	Number	%	Rate per 1000 population	Number	%	Rate per 1000 population	
<i>Hospital beds</i>							
Day-case beds	721	5.8	0.2	1 697	12.2	0.4	135.4
Inpatient beds	11 704	94.2	3.1	12 182	87.8	2.8	4.1
<i>Total beds</i>	<i>12 425</i>	<i>100</i>	<i>3.3</i>	<i>13 879</i>	<i>100</i>	<i>3.1</i>	<i>11.7</i>
<i>Discharges</i>							
Day-case discharges	273 677	34.3	72.2	771 145	56.3	174.4	181.8
Inpatient discharges	525 181	65.7	138.6	597 449	43.7	135.1	13.8
<i>Total discharges</i>	<i>798 858</i>	<i>100</i>	<i>210.8</i>	<i>1 368 594</i>	<i>100</i>	<i>309.5</i>	<i>71.3</i>
<i>Beds days</i>							
Day case	273 677	7.5	72.2	771 145	17.2	174.4	181.8
Inpatient	3 371 089	92.5	889.6	3 700 959	82.8	836.9	9.8
<i>Total bed days</i>	<i>3 644 766</i>	<i>100</i>	<i>961.8</i>	<i>4 472 104</i>	<i>100</i>	<i>1 011.3</i>	<i>22.7</i>
<i>Acute inpatient</i>							
ALOS (days) <sup>a</sup>	5.0	–	–	4.6	–	–	–8.0
<i>ED attendances</i>	<i>1 211 279</i>	<i>–</i>	<i>319.6</i>	<i>1 150 674</i>	<i>–</i>	<i>260.2</i>	<i>–5.0</i>
<i>Outpatient attendances</i>							
<i>attendances</i>	<i>1 996 474</i>	<i>–</i>	<i>526.8</i>	<i>3 288 917</i>	<i>–</i>	<i>743.7</i>	<i>64.7</i>

Sources: ESRI-HPID, 2007; DoHC, 2009a, 2010a; ESRI-HRID, 2010.

Notes: These data relate to hospitals that participated in the Hospital In-Patient Enquiry (HIPE); All acute public hospitals (apart from one) and a small number of long stay hospitals participated in HIPE in 2008; HIPE data collection has changed over the period (see, for example, ESRI-HRID, 2008b); <sup>a</sup>Acute inpatients are inpatients with a length of stay of 30 days or less.

HSE initiative to monitor and assess performance within the acute public hospital sector (HSE, 2010b). In addition, the DRG system has been (and continues to be) used to inform the planning and reconfiguration of acute hospital services.

## 15.2 Development and updates of the DRG system

### 15.2.1 The current DRG system at a glance

The Australian Refined Diagnosis-Related Group (AR-DRG) system was adopted in Ireland in 2005 for classifying day-case and inpatient activity (excluding non-acute psychiatry, geriatric care and rehabilitation) (ESRI-HRID, 2008a). The current version of AR-DRGs (Version 6.0) was introduced in Ireland in January 2009. For the 2010 casemix budgetary adjustment, a patient classification system specifically designed for the HSE – Treatment-Related Groups (TRGs) – was used for the first time to group outpatient attendances. There is currently no grouper for ED attendances in Ireland. The remainder of this chapter will focus on the day-case and inpatient casemix models. The HSE's National Casemix Programme is responsible for developing these models and combining the required cost and activity data from hospitals. The AR-DRG algorithm is outlined in section 15.3.2.

### 15.2.2 Development of the DRG system

Since DRGs were introduced in Ireland in the early 1990s, 10 classification systems have been used for inpatient and day-case activity (see Table 15.4). These classification systems are discussed in greater detail in the remainder of this section.

#### *Inpatient classification systems*

Between 1992 and 2002, the United States Health Care Financing Administration (HCFA)-DRGs, together with Maryland cost/service weights, were used to group

**Table 15.4** Overview of inpatient and day-case classification systems used in Ireland

<i>Data year<sup>a</sup></i>	<i>Inpatient classification system</i>		<i>Day-case classification system</i>	
	<i>System</i>	<i>Version</i>	<i>System</i>	<i>Version</i>
1992–1993	HCFA	9	No grouper	
1994–1998		12	DPG procedural grouper	
1999–2001		16		
2002			DG procedural grouper	
2003–2004	AR-DRG	5.0		
2005–2008		5.1	ADRG	5.1
2009 to date		6.0		6.0

*Note:* <sup>a</sup>Data year refers to the year(s) in which the discharge activity took place.

## 278 Diagnosis-Related Groups in Europe

inpatients in Ireland (see Table 15.4). During this period, updates to the grouper were driven by revisions to the clinical coding scheme (International Classification of Diseases 9<sup>th</sup> revision – Clinical Modification, ICD-9-CM) in Ireland. The HCFA classification had a maximum of two severity levels – with or without complications.

Recognizing the need to update the clinical coding scheme to ICD-10, the DoHC commissioned a review of alternative grouping schemes in 2003 (Aisbett et al., 2007). As part of this review, several groupers were evaluated against a range of criteria, including vendor support, and international use and recognition. The review recommended the adoption of an unmodified version of the AR-DRG Version 5.0 grouper.

For 2003 and 2004, it was necessary to use a coding map to convert clinical data coded in ICD-9-CM to ICD-10-AM (10<sup>th</sup> revision, Australian Modification) for diagnoses and to the Australian Classification of Health Interventions (ACHI) for procedures.<sup>7</sup> However, since 2005, all Hospital In-Patient Enquiry (HIPE) data have been coded using unmodified versions of ICD-10-AM and ACHI (see Murphy and colleagues (2004) on adopting these coding schemes).

Table 15.5 demonstrates key differences between the four DRG systems used to group inpatients in Ireland since 1999. Compared to previous classifications, AR-DRGs have a slightly higher number of groups, more severity levels, and can be applied to day cases as well as inpatients.

**Table 15.5** Key facts on DRG systems used in Ireland since 1999

	<i>HCFA-DRG Version 16</i>	<i>AR-DRG</i>		
		<i>Version 5.0</i>	<i>Version 5.1</i>	<i>Version 6.0</i>
Year of introduction	1999	2003	2005	2009
Data year	1999–2002	2003–2004	2005–2008	2009 to date
Number of groups	511	665	665	698
Sub-classification	None	ADRG (399)	ADRG (399)	ADRG (399)
Maximum severity levels	2	4	4	4
Birth weight	Not used	Required		
Type of cases included	Inpatient only, excluding non-acute psychiatric care, geriatric care and rehabilitation	Inpatients and day cases, excluding non-acute psychiatric care, geriatric care and rehabilitation		
Number of MDCs	25	24 <sup>a</sup>	24 <sup>a</sup>	24 <sup>a</sup>
Number of participating public hospitals	32 (2002)	32 (2004)	39 (2008)	39 (2009)

*Sources:* Based on information from HCFA (undated); see also Commonwealth Department of Health and Ageing, 2002, 2004, 2008; National Casemix Programme, 2010a.

*Note:* <sup>a</sup>Includes Pre-MDC.

*Day-case classification systems*

In Ireland, a day case is characterized by a patient being admitted electively and discharged on the same day, as planned. The National Casemix Programme was extended to include day-case activity in the mid-1990s. The first day-case classification system – the Day Patient Grouper (DPG) – was developed by the DoHC, based on similar United States groupers (Table 15.4). The DPG defined 73 groups, differentiated mainly on the basis of principal procedure coded in ICD-9-CM. Cases without procedures were grouped into a single medical day-case group. In 2002, the DPG was replaced by the Day Grouper (DG), which was also developed by the DoHC and comprised 169 groups. Like its predecessor, the DG was predominantly driven by the principal procedure, although diagnoses were also used in some cases to determine the group.

With the introduction of AR-DRGs in Ireland, day cases and inpatients could be included in the same classification system. Under the AR-DRG classification scheme, Adjacent DRGs (ADRGs) are used to group day cases (see subsection 15.3.2).<sup>8</sup> Unlike the procedural-based DPGs and DGs, the AR-DRG classification for day cases incorporates more information than simply the principal procedure.

### ***15.2.3 Data used for development and updates of the DRG system***

The AR-DRG classification system from Australia, which was adopted in Ireland, was developed in the late 1990s by the Australian Casemix Clinical Committee (ACCC). To update the AR-DRG system, the ACCC relies on Australian clinical and cost data, as well as on input from Australian health professionals (Commonwealth Department of Health and Ageing, 2008).

Irish cost/service weights are determined by modifying Australian cost/service weights using Irish data from the hospital costing file. The costing file is based on hospitals' Annual Financial Statements (AFSs) and consists of specialty-level hospital cost data for inpatients and day cases.<sup>9</sup>

Data on day-case and inpatient activity for the DRG system and the National Casemix Programme are obtained from the HIPE system, which is the only national source of administrative, demographic and clinical information on discharges from acute public hospitals in Ireland. Since 1990, the Economic and Social Research Institute (ESRI) has been responsible for all aspects of managing this database.

### ***15.2.4 Regularity and method of system updates***

The AR-DRG grouper classification is updated every two years in Australia in conjunction with the update of the ICD-10-AM classification. Since their adoption in Ireland, the clinical coding and AR-DRG classifications have been updated every four years (only twice so far – 1 January 2005 and 1 January 2009).<sup>10</sup> To date, therefore, Ireland has adopted every second version of the AR-DRG classifications.

## 15.3 The current patient classification system

### 15.3.1 Information used to classify patients

In Ireland, administrative, demographic and clinical data from the HIPE database are used to group hospital discharges into AR-DRGs (see subsection 15.2.3).<sup>11</sup>

#### *Administrative and demographic data*

Relevant administrative data include admission and discharge dates, discharge destination (for example, home, transfer to rehabilitation), and length of stay. Demographic variables consist of date of birth, age in years/days, and gender. Three further variables (non-acute length of stay, leave days, and mental health legal status) are required by the grouper, but are not available in Ireland and, consequently, are set to their default values.

#### *Clinical data*

Since January 2009, clinical data are coded in the HIPE using the sixth edition of ICD-10-AM, which contains the ACHI classification for procedures. Two sets of coding standards apply: the Australian coding standards and the complementary Irish coding standards. The grouper requires a principal diagnosis and can accept up to 29 additional diagnoses and up to 30 procedures.<sup>12</sup> Resource-consumption information – such as length of stay in an intensive care environment – is implicit in the coded procedures used in the grouper.

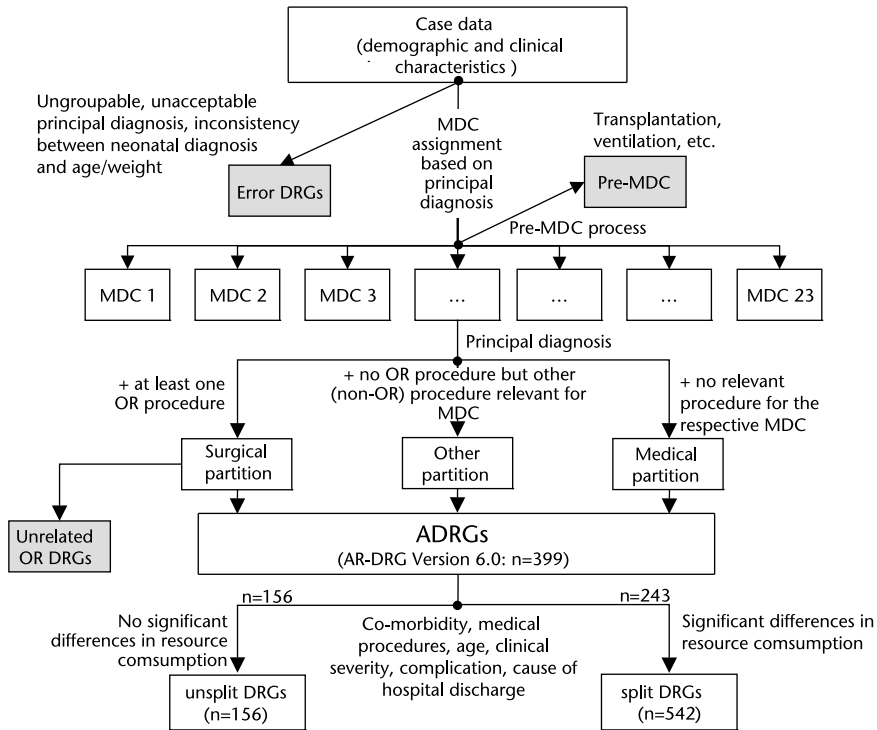
### 15.3.2 Classification algorithm

Grouping occurs in the hospital after the case has been coded. Each discharge is allocated to one group only. The AR-DRG grouping algorithm consists of four steps (see Figure 15.1).<sup>13</sup> In the first step, data on each discharge undergo a series of checks for completeness, validity and consistency. Failing a check may result in a discharge being assigned to an Error AR-DRG. In addition to these checks, HIPE data are subject to rigorous validation checks during the collection process (see subsection 15.3.3).

In the second step, the principal diagnosis determines the allocation to one of 24 major diagnostic categories (MDCs).<sup>14</sup> For certain specialist, high-cost conditions (such as transplants), however, the initial MDC assignment may be altered, with some discharges being reclassified to a Pre-MDC.

The presence of a procedure and its type are used to classify discharges into one of three partitions, which constitutes the third step. A discharge is assigned to the 'surgical' partition if there was at least one operating room (OR) procedure; to the 'other' partition if there was at least one relevant non-OR procedure; or to the 'medical' partition if there were no relevant procedures (that is, a procedure may have been performed, but it was not relevant to the MDC). After the partition is assigned, the discharge is allocated to one of 399 ADRGs, depending





**Figure 15.1** Assignment to DRGs using the AR-DRG classification scheme

Source: Adapted from Commonwealth Department of Health and Ageing, 2008.

on diagnoses, procedures and administrative data. The ADRG assignment completes the grouping process for day cases.

Finally, the discharge is allocated to one of 698 AR-DRGs according to severity level, which is determined by characteristics considered to be drivers of resource use (for example, presence of complications and co-morbidities (CCs), age, gender).<sup>15</sup> Usually, CCs are considered in combination to provide a composite score (the Patient Clinical Complexity Level, PCCL) that indicates the patient's overall complexity and determines the final AR-DRG.<sup>16</sup>

Each AR-DRG consists of four alphanumeric characters (Commonwealth Department of Health and Ageing, 2008). The first character is a letter between A and Z indicating the MDC. The second and third characters are numbers, which (together with the MDC letter) define the three-character ADRG. The final character is a letter and indicates whether the ADRG was not split (denoted by 'Z') or the level of severity/resource use (with four categories starting with 'A', indicating the highest resource use).

### 15.3.3 Data quality and plausibility checks

In addition to the data checks described in subsection 15.3.2, HIPE data are also subjected to several plausibility and validity checks at local (hospital) and national

levels. The first set of plausibility checks occurs in hospitals during the data-entry phase and these have been built into the standardized HIPE data-collection software, which has been developed by the Health Research and Information Division (HRID) within the ESRI and is provided free of charge to all participating hospitals. The software has been designed to validate information as it is entered, so that coders can readily reference patient charts if necessary. Such plausibility checks include: validation of diagnosis and procedure codes against patient administrative and demographic details; examining the ordering of diagnoses to ensure that certain diagnosis codes are never used as the principal diagnosis; and notifying coders of certain unusual diagnosis/procedure combinations.

A further set of checks is conducted by the HRID on the national HIPE file. First, year-on-year changes in casemix-adjusted discharges (calculated on the same basis for all years) for a particular hospital are examined. Second, casemix-adjusted discharges are compared to costs in order to identify where activity has increased without a corresponding increase in costs.

Analysis of the national file may highlight specific areas at specialty or AR-DRG level where patient-level audits are required. These audits are carried out by trained coders, external to the hospital. Local audits by hospitals are also supported by the HIPE system and the HRID has developed the HIPE Coding Audit Toolkit (HCAAT) to assist in this process.<sup>17</sup>

The National Casemix Programme may revise the number of allocated casemix-adjusted discharges if there is evidence from these checks and external audits that inaccurate data have been submitted (such as the inclusion of outpatient activity in the day-case model). Where costs or activity data are found to be incomplete or inaccurate, this would be expected to result in a lower casemix budgetary adjustment.

## **15.4 Cost accounting within hospitals**

### ***15.4.1 Regulation***

Hospitals participating in the National Casemix Programme must submit their cost data to the hospital costing dataset in a standardized format, as outlined in the casemix specialty costing manual. These data are then submitted to the National Casemix Programme, which performs regular data quality audits. In the first step of the audit process, all costs submitted in the costing file are reconciled with the AFS to check for omissions or errors. Hospitals' costs and patient activity data are then linked using the national casemix models. The overall audit process typically involves discussions between the National Casemix Programme and the hospitals. Where issues remain unresolved, the National Casemix Programme can amend the hospital costing file where the costing manual rules have been breached.

### ***15.4.2 Main characteristics of the cost-accounting system***

The cost-accounting system for the casemix models starts by adjusting hospitals' AFSs (for example, excluding capital expenditures which are not financed

through the national casemix models; National Casemix Programme, 2010b). In line with the HSE's costing manual, the adjusted AFS costs are allocated on a top-down basis to specialty level for inpatients and day cases, as well as to outpatient clinics, primarily using direct allocation.

Once the hospital costing files are submitted and the auditing process by the National Casemix Programme is complete, the national costing file is prepared. For compatibility with the national casemix models, the costing file is arranged into the following 13 cost centres: allied health; critical care; coronary care unit; emergency; imaging; pathology; medical pay; prosthesis; nursing; pharmacy; theatre operating procedures; theatre non-operating procedures; and blood.

When the national casemix models are complete, the combined national patient activity and costing file is used to produce national statistics (for example, average cost per casemix-adjusted discharge).

## **15.5 DRGs for hospital financing**

### ***15.5.1 Range of services and costs included in casemix-adjusted budgets***

Public hospitals are invited to participate in the National Casemix Programme by the HSE. The number of participating acute public hospitals increased from 15 in 1993 to 39 in 2009 (HSE, 2010a; National Casemix Programme, 2010a). To ensure comparability, hospitals are assigned to one of four peer groups in the Programme. In the 2009 casemix models, Group I included eight major academic teaching hospitals; Group II contained 26 hospitals; and three maternity and two paediatric hospitals constituted the remaining two groups. Casemix budgetary adjustments are calculated separately for each hospital group.

There are separate national casemix models for day cases and inpatients; non-acute psychiatry, geriatric care and rehabilitation are excluded. All costs are included in the models, apart from those related to capital, depreciation, pensions, bad debts and transfers from other hospitals. Teaching costs are included but research costs are financed separately. Less than 80 per cent of all acute public hospital costs were included in the most recent casemix models (run in 2009; National Casemix Programme, 2010d). As part of the cost-reconciliation process, all participating hospitals can make submissions on a case-by-case basis to the National Casemix Programme for additional funding for unusual and/or high-cost activity.

### ***15.5.2 Service weights and relative values***

In Ireland, service weights (locally referred to as cost weights) differ from relative values (RVs).<sup>18</sup> Service weights indicate the share of specialty costs allocated to each AR-DRG and are defined for each of the 13 cost centres listed in subsection 15.4.2. Service weights are based on the patient cost data from

Australia, adapted to the Irish health care system by the inclusion of Irish cost data. In contrast, RVs indicate the relative resource intensity of each AR-DRG.<sup>19</sup> RVs are calculated separately for day cases and inpatients as part of the casemix models using the national cost and activity files. A separate set of RVs is determined for paediatric hospitals, given their specialist nature.

The process for determining the inpatient RVs is described here.

1. Inpatient discharge data are initially trimmed at three standard deviations from the mean length of stay for each AR-DRG to remove cases with extremely short or long lengths of stay from the calculation of the upper and lower length-of-stay thresholds, which are set at 1.96 standard deviations above and below the mean, respectively.<sup>20</sup>
2. The average cost per cost centre and per hospital is determined using the hospital's inpatient cost and activity data, together with inpatient service weights.
3. The inpatient cost and discharge activity data are analysed per AR-DRG to calculate the national average costs per DRG and RVs.

### ***15.5.3 DRG-based budgetary adjustments***

The following subsections describe how hospitals' casemix budgetary adjustments are determined.

#### *Calculation of hospital casemix-adjusted activity/casemix units*

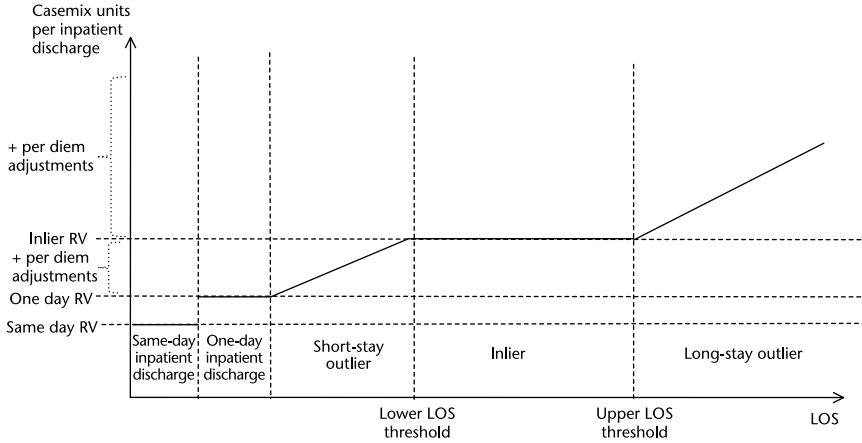
The casemix unit (CMU) is determined by the RV of the AR-DRG to which the patient is assigned, the patient's length of stay, and the upper and lower length-of-stay thresholds of the AR-DRG. The casemix-adjusted activity of each hospital is the sum of the CMUs across all discharges. Since RVs are calculated using different models and cost data for inpatients and day cases, it is not possible to combine casemix-adjusted inpatient activity with that for day cases.

Figure 15.2 illustrates how the CMU is determined for inpatient discharges. The CMU for a same-day, one-day or inlier case can be determined directly, since same-day, one-day and inlier RVs are calculated separately for each AR-DRG. If the patient is a low outlier, the CMU is determined using the one-day RV with a per diem adjustment. Conversely, the CMU for high outliers is based on the inlier RV of the patient's AR-DRG plus a per diem AR-DRG adjustment for each day in hospital above the upper threshold.

Casemix-adjusted day cases are simply the RV of the applicable ADRG.

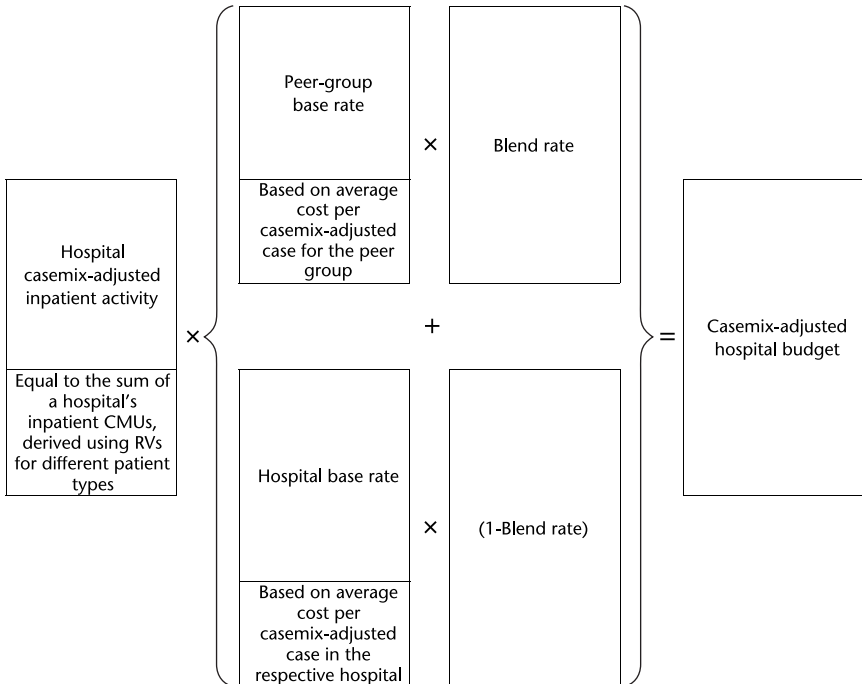
#### *Determining hospital casemix budgetary adjustment*

Figure 15.3 shows the calculation of a casemix-adjusted budget for inpatients. The casemix-adjusted budget of a hospital depends on the hospital's CMUs and base rate, a peer-group base rate and a blend rate. The hospital base rate is calculated by dividing the total costs of the hospital by the hospital's CMUs.



**Figure 15.2** Distribution of CMUs for inpatient discharges

*Notes:* A same-day case is admitted and discharged on the same day. Unlike a day case, which is an elective episode, a same-day case may be admitted as an emergency. A one-day case has admission and discharge dates on consecutive days, thereby spending one night in hospital. An inlier has an LOS between the upper and lower bounds of the AR-DRG. A short-stay outlier is admitted for more than one day and is discharged before their LOS exceeds the lower bound. The RV for this case is a per diem weight. A long-stay outlier case has an LOS which exceeds the upper bound. The RV for this case is a per diem weight.



**Figure 15.3** Calculation of the hospital inpatient casemix-adjusted budget

**Table 15.6** Inpatient and day-case blend rates, 2000–2010 casemix models

Model data <sup>a</sup>	Model	Budgetary adjustment	Blend rate	
			Inpatient (%)	Day case (%)
1999/2000	2000	2001	15	5
2000/2001	2001	2002	15	5
2001/2002	2002	2003	20	10
2002/2003	2003	2004	20	10
2003/2004	2004	2005	20	20
2004/2005	2005	2006	30	30
2005/2006	2006	2007	40	40
2006/2007	2007	2008	50	50
2007/2008	2008	2009	60	60
2008/2009	2009	2010	70	70
2009/2010	2010	2011	80	80

Source: National Casemix Programme, 2010a.

Notes: A blend rate of more than 50 per cent implies that hospital budgets are determined more by the costs of treating patients in the hospital's peer group than based on the hospital's own costs. For example, a blend rate of 70 per cent implies that the calculated cost for a casemix-adjusted discharge will be based on 70 per cent of the peer-group costs and 30 per cent of the hospital's own costs. <sup>a</sup>The casemix models include a workload adjustment which is calculated on the basis of activity in the latter half of year  $t$  and the first half of year  $t+1$ . Thus, a blend rate of 70 per cent is applied to the inpatient/day-case adjustments (68 per cent) and the workload adjustment (2 per cent).

The peer-group base rate is calculated by dividing total costs of treating patients in a particular hospital group by the total CMUs for that group. The blend rate is used to mitigate any potentially destabilizing effects of the casemix budgetary adjustments on hospitals.<sup>21</sup> Since the early 2000s, the blend rate has progressively increased – a trend which is likely to continue (see Table 15.6). An ADRG-based budget is similarly calculated for day cases.

There is a lag between the time period to which the activity and cost data relate and the application of the casemix budgetary adjustment. For example, the 2009 casemix models used activity and cost data from 2008 and from the first half of 2009 to calculate the casemix budgetary adjustments that applied to hospitals' 2010 budgets.

The difference between the hospital's casemix-adjusted budget and their historic allocation is the casemix budgetary adjustment. A hospital will receive a positive budget adjustment if the calculated casemix-adjusted budget is greater than the historical budgets. The casemix models are revenue-neutral within each peer group, so, where a hospital gains a positive adjustment, another hospital(s) in the same peer group will incur a negative adjustment.

### 15.5.4 Quality-related adjustments

The national casemix models do not currently incorporate quality-related adjustments.

### **15.5.5 Main financial incentives for hospitals**

The explicit link between activity and cost data under the National Casemix Programme inevitably means that hospitals face a number of potential financial incentives to influence measurement of activity and costs. They may attempt to modify their coding practices to classify patients into AR-DRGs with higher weights (that is, up-coding or 'DRG creep'); submit cases to the incorrect casemix model; or transfer patients as soon as possible to non-participating hospitals or other institutions. However, most of these unintended consequences can be monitored and controlled through regular data audits by the National Casemix Programme and the ESRI.

Participation in the National Casemix Programme may be expected *ex ante* to encourage hospitals to improve their relative efficiency. However, this incentive may be weakened to some extent by the time-lag between when the activity was undertaken and the budgetary adjustment. The inclusion of a workload adjustment in the casemix models reduces this lag to some extent (see subsection 15.5.3).

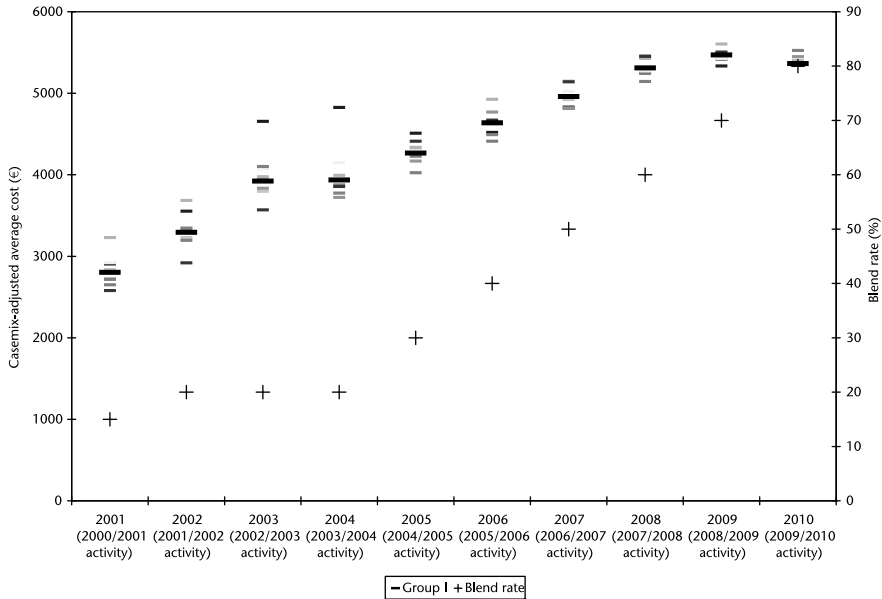
### **15.6 New/innovative technologies**

Participating hospitals can make submissions on a case-by-case basis to the National Casemix Programme for additional funding for high-cost drugs and innovative treatments. This mechanism is not considered to have a significant impact on the introduction of new technologies. Rather, the availability of capital investment funding would be considered to have a greater influence on the adoption of new technologies.

### **15.7 Evaluation of the DRG system in Ireland**

The application of DRGs in casemix funding has been assessed as part of a number of national reviews within the Irish health sector. The 2001 National Health Strategy considered the National Casemix Programme then in place to be 'the most developed system for assessing comparative efficiency and for creating incentives for good performance' and committed to support it at national and regional level (DoHC, 2001, p. 114). In 2004, the DoHC undertook a 'root and branch' review of the National Casemix Programme, which committed the Department to expanding the number of participating hospitals, increasing the blend rate, and incorporating 'sub-acute' and 'non-acute' care. Progress on each of these commitments is ongoing. The review also confirmed the adoption of ICD-10-AM as the national clinical coding standards in Ireland, thereby confirming the recommendations arising from assessments of the best options available internationally for updating clinical coding and the DRG system (Murphy et al., 2004; Aisbett et al., 2007).<sup>22</sup>

The parameters derived from the national casemix models can provide a useful insight into how the operation of the National Casemix Programme influences hospital behaviour. Figure 15.4 shows the variability in casemix-adjusted average



**Figure 15.4** Casemix-adjusted inpatient average cost and blend rate for Group I hospitals, 2001–2010

*Source:* Based on data contained in Circulars prepared by the National Casemix Programme.

*Notes:* Each horizontal bar represents an observation on a hospital. The larger horizontal bar represents the average for the hospital group. Data for 2001 were converted from Irish pounds to Euros using an exchange rate of €1 = IR£0.787564.

costs for major teaching hospitals from the 2001–2010 inpatient casemix models. Interestingly, there has been convergence in Group I hospitals' average costs over time and across hospitals, towards the mean group cost. This convergence may be associated with the increasing blend rate, which may have encouraged hospitals (particularly those with above-average costs) to change their cost profiles in line with those of their peers.

## 15.8 Outlook: Future developments and reform

The application of DRGs in the Irish acute public hospital system has travelled an interesting route. The uses of the DRG system have extended beyond hospital reimbursement to informing the planning and reconfiguration of acute public hospital services; facilitating hospital benchmarking; and adjusting and monitoring the hospital consultants' workloads. Most recently, a review of charges associated with private and semi-private treatment in public hospitals has recognized the advantages of a DRG-based case payment system and recommended the piloting of such a system (DoHC, 2010b).

The continued role for DRGs in hospital reimbursement has been recommended in two reports. The first – entitled *Promoting performance-related services*



and commissioned by the HSE – suggested implementing cost and volume contracts over a period of ten years. This prompted the HSE to establish a project team, which recognized the advancement of patient-level costing as a key issue. Consequently, the HSE initiated a pilot project in several hospitals in 2009 to assess potential approaches to patient-level costing (National Casemix Programme, 2010c). The second report by an Expert Group established by the Minister for Health and Children in 2009 recommended a mix of hospital payment mechanisms, incorporating DRG-based case payment and lump-sum payments (Ruane, 2010). However, it remains to be seen how this will be translated into policy.

Alongside the continued commitment to the use of DRGs in Ireland has been the simultaneous achievement of improvements in quality, technical factors and the system's scope. As data systems improve and the technical capability to implement increasingly sophisticated measurement systems increases, new and better DRG systems are expected to be developed in the future. However, the core objective of using DRGs in Ireland remains the same: achieving greater transparency in relating resource use to outputs within the acute hospital sector.

## 15.9 Notes

- 1 Assistance provided by Brian Donovan and Mark O'Connor is gratefully acknowledged. The authors are also obliged to Wilm Quentin and Conrad Kobel for comments on earlier drafts.
- 2 Due to profit repatriation by multinational companies located in Ireland, GNP is considered to be a more appropriate indicator of economic performance than GDP (Nolan, 2005; McDaid et al., 2009).
- 3 A private patient may occupy a public bed only if admitted as an emergency when a designated private bed is not available (Government of Ireland, 1991a, b, c). The Minister for Health and Children approves public/private bed designation (DoHC, 1999).
- 4 It has been estimated that there are 19 private hospitals operating in Ireland (Brick et al., 2010).
- 5 Between 2001 and 2008, all those aged 70 years and over, irrespective of income, received a medical card (McDaid et al., 2009; Citizens Information Board, 2011).
- 6 Some changes in data collection partly account for increased activity reported (see, for example, ESRI-HRID, 2008b).
- 7 The procedure classification system used in Ireland (namely, ICD-10-AM) is more commonly referred to as the Australian Classification of Health Interventions (ACHI).
- 8 ADRGs are similar to 'base-DRGs' used in other countries.
- 9 A hospital's AFSs are subject to audit, typically by the Comptroller and Auditor General (National Casemix Programme, 2010b).
- 10 Updates to the classification system are covered within a contract between Ireland and Australia.
- 11 For details of the variables required for grouping, see Commonwealth Department of Health and Ageing (2008).
- 12 Until 2010, the HIPE scheme collected up to 19 additional diagnoses and up to 20 procedures.
- 13 Full details and examples of the grouping algorithm are contained in the AR-DRG definitions manual (Commonwealth Department of Health and Ageing, 2008).

## 290 Diagnosis-Related Groups in Europe

- 14 A discharge may be categorized as 'unassignable to MDC' or to an 'error DRG' where it cannot be directly assigned to one of the 24 MDCs.
- 15 An ADRG is the first three characters of an AR-DRG (for example, B78 is the ADRG associated with AR-DRG B78B).
- 16 The PCCL ranges from 0 (lowest complexity level) to 4 (highest). A high PCCL indicates the presence of additional, unrelated CCs that are expected to affect length of stay and cost.
- 17 For further information on HCAT, see the information leaflet available from the ESRI web site ([http://www.esri.ie/health\\_information/hipe/clinical\\_coding/data\\_quality/HCAT\\_Info\\_Leaflet\\_2007.pdf](http://www.esri.ie/health_information/hipe/clinical_coding/data_quality/HCAT_Info_Leaflet_2007.pdf), accessed 10 July 2011).
- 18 What are termed 'relative values' in Ireland may be referred to as cost weights in other countries.
- 19 An average AR-DRG has an RV of 1 and more costly AR-DRGs would have an RV greater than 1.
- 20 For these calculations, length-of-stay values are transformed into natural logarithms.
- 21 For example, a blend rate of 70 per cent implies that the calculated cost for a casemix-adjusted discharge will be based on 70 per cent of the peer-group costs and 30 per cent of the hospital's own cost.
- 22 Also, a review of the clinical coder training programme and data quality and audit procedures within the HIPE was commissioned in 2004 by the ESRI and undertaken by Michelle Bramley and Beth Reid, from the University of Sydney.

### 15.10 References

- Aisbett, C., Wiley, M., McCarthy, B., Mulligan, A. (2007). *Measuring Hospital Casemix: Evaluation of Alternative Approaches for the Irish Hospital System*. Dublin: Economic and Social Research Institute (ESRI Working Paper No. 192).
- Brennan, N. (2003). *Report of the Commission on Financial Management and Control Systems in the Health Service (The Brennan Report)*. Dublin: The Stationery Office.
- Brick, A., Nolan, A., O'Reilly, J., Smith, S. (2010). *Resource Allocation, Financing and Sustainability in Health Care: Evidence for the Expert Group on Resource Allocation and Financing in the Health Sector*. Dublin: Department of Health and Children and Economic and Social Research Institute.
- Citizens Information Board (2010). *Charges for Hospital Services*. Dublin: Citizens Information Board ([http://www.citizensinformation.ie/en/health/hospital\\_services/hospital\\_charges.html](http://www.citizensinformation.ie/en/health/hospital_services/hospital_charges.html), accessed 11 April 2011).
- Citizens Information Board (2011). *Medical Cards*. Dublin: Citizens Information Board ([http://www.citizensinformation.ie/en/health/entitlement\\_to\\_health\\_services/medical\\_card.html](http://www.citizensinformation.ie/en/health/entitlement_to_health_services/medical_card.html), accessed 5 April 2011).
- Colombo, F., Tapay, N. (2004). *Private Health Insurance in Ireland: A Case Study*. Paris: Organisation for Economic Co-operation and Development (OECD Health Working Paper No. 10).
- Commission on Health Funding (1989). *Report of the Commission on Health Funding*. Dublin: The Stationery Office.
- Commonwealth Department of Health and Ageing (2002). *Australian Refined Diagnosis Related Groups Version 5.0 Definitions Manual*. Canberra: Commonwealth Department of Health and Ageing.
- Commonwealth Department of Health and Ageing (2004). *Australian Refined Diagnosis Related Groups Version 5.1 Definitions Manual*. Canberra: Commonwealth Department of Health and Ageing.

- Commonwealth Department of Health and Ageing (2008). *Australian Refined Diagnosis-Related Groups Version 6.0 Definitions Manuals*. Canberra: Commonwealth Department of Health and Ageing.
- DoHC (1999). *White Paper – Private Health Insurance*. Dublin: The Stationery Office.
- DoHC (2001). *Quality and Fairness: A Health System for You*. Dublin: The Stationery Office.
- DoHC (2009a). *Health in Ireland: Key Trends 2009*. Dublin: Department of Health and Children.
- DoHC (2009b). *Value for Money and Policy Review of the Economic Cost and Charges Associated with Private and Semi-Private Treatment Services in Public Hospitals – Interim Report*. Dublin: Department of Health and Children ([http://www.dohc.ie/publications/pdf/vfm\\_review\\_economic\\_cost\\_interim\\_report.pdf?direct=1](http://www.dohc.ie/publications/pdf/vfm_review_economic_cost_interim_report.pdf?direct=1), accessed 31 May 2010).
- DoHC (2010a). *Health in Ireland: Key Trends 2010*. Dublin: Department of Health and Children.
- DoHC (2010b). *Value for Money and Policy Review of the Economic Cost and Charges Associated with Private and Semi-Private Treatment Services in Public Hospitals*. Dublin: Department of Health and Children ([http://www.dohc.ie/publications/pdf/vfm\\_review\\_economic\\_cost\\_final\\_report.pdf](http://www.dohc.ie/publications/pdf/vfm_review_economic_cost_final_report.pdf), accessed 17 December 2010).
- ESRI-HPID (2007). *Activity in Acute Public Hospitals in Ireland: Annual Report 2004*. Dublin: Economic and Social Research Institute, Health Policy and Information Division.
- ESRI-HRID (2008a). *Activity in Acute Public Hospitals in Ireland: Annual Report 2005*. Dublin: Economic and Social Research Institute, Health Research and Information Division.
- ESRI-HRID (2008b). *Activity in Acute Public Hospitals in Ireland: Annual Report 2006*. Dublin: Economic and Social Research Institute, Health Research and Information Division.
- ESRI-HRID (2010). *Activity in Acute Public Hospitals in Ireland: Annual Report 2008*. Dublin: Economic and Social Research Institute, Health Research and Information Division.
- Government of Ireland (1991a). *Health (Amendment) Act, 1991*. Dublin: Office of the Attorney General ([www.irishstatutebook.ie/1991/en/act/pub/0015/index.html](http://www.irishstatutebook.ie/1991/en/act/pub/0015/index.html), accessed 26 May 2010).
- Government of Ireland (1991b). *Health Services (In-Patient) Regulations, 1991 (S.I. No. 135/1991)*. Dublin: Office of the Attorney General ([www.irishstatutebook.ie/1991/en/si/0135.html](http://www.irishstatutebook.ie/1991/en/si/0135.html), accessed 26 May 2010).
- Government of Ireland (1991c). *Health Services (Out-Patient) Regulations, 1991 (S.I. No. 136/1991)*. Dublin: Office of the Attorney General ([www.irishstatutebook.ie/1991/en/si/0136.html](http://www.irishstatutebook.ie/1991/en/si/0136.html), accessed 26 May 2010).
- HCFA (undated). *Diagnosis Related Groups Definitions Manual, Version 16.0*. St. Paul, MN: 3M Health Information Systems.
- HSE (2008). *Consultant Contract 2008 – Measurement of Public–Private Mix*. Kildare: Health Service Executive ([http://www.hse.ie/eng/staff/HR/tandc/Consultant\\_Contract\\_2008\\_Measurement\\_of\\_Public\\_Private\\_Mix.pdf](http://www.hse.ie/eng/staff/HR/tandc/Consultant_Contract_2008_Measurement_of_Public_Private_Mix.pdf), accessed 4 August 2010).
- HSE (2010a). *Casemix Budget Outturns for 2009*. Kildare: Health Service Executive (<http://www.hse.ie/eng/services/Publications/corporate/2009casemix.html>, accessed 12 May 2010).
- HSE (2010b). *HealthStat – Supporting High Performance*. Kildare: Health Service Executive (<http://www.hse.ie/eng/staff/Healthstat/about/>, accessed 4 August 2010).
- HSE (2010c). *Hospitals and Cancer Control*. Kildare: Health Service Executive ([http://www.hse.ie/eng/services/Find\\_a\\_Service/HospitalsCancer/](http://www.hse.ie/eng/services/Find_a_Service/HospitalsCancer/), accessed 3 August 2010).
- HSE (2010d). *Integrated Services*. Kildare: Health Service Executive ([http://www.hse.ie/eng/about/Who/is/Integrated\\_Services.html](http://www.hse.ie/eng/about/Who/is/Integrated_Services.html), accessed 26 April 2010).
- McDaid, D., Wiley, M., Maresso, A., Mossialos, E. (2009). Ireland: Health system review. *Health Systems in Transition*, 11(4):1–267.
- Murphy, D., Wiley, M.M., Clifton, A., McDonagh, D. (2004). *Updating Clinical Coding in Ireland: Options and Opportunities*. Dublin: Economic and Social Research Institute (ESRI).

## 292 Diagnosis-Related Groups in Europe

- National Casemix Programme (2010a). *Casemix Manual: Casemix Annual (Technical) Report 2010 – Part 4*. Dublin: National Casemix Programme.
- National Casemix Programme (2010b). *Costing Manual: Casemix Annual (Technical) Report 2010 – Part 5*. Dublin: National Casemix Programme.
- National Casemix Programme (2010c). *Technical Aspects of the National Casemix Programme – Part II*. Dublin: National Casemix Programme.
- National Casemix Programme (2010d). *C1-10 Casemix Circular Tables*. Dublin: National Casemix Programme.
- Nolan, A. (2005). Health: funding, access and efficiency, in J. O'Hagan, C. Newman, eds. *The Economy of Ireland: National and Sectoral Policy Issues*. Dublin: Gill and Macmillan.
- Nolan, B., Wiley, M.M. (2000). *Private Practice in Irish Public Hospitals*. Dublin: Oak Tree Press in association with the Economic and Social Research Institute.
- OECD (2009). *OECD Health Data 2011. How does Ireland Compare*. Paris: Organisation for Economic Co-operation and Development (<http://www.oecd.org/dataoecd/45/53/43216301.pdf>, accessed 10 July 2011).
- O'Reilly, J., Wiley, M. (2010). Who's that sleeping in my bed? Potential and actual utilization of public and private in-patient beds in Irish acute public hospitals. *Journal of Health Services Research and Policy*, 15:210–14.
- Prospectus (2003). *Audit of Structures and Functions in the Health System*. Dublin: The Stationery Office.
- Robbins, G., Lapsley, I. (2008). Irish voluntary hospitals: an examination of a theory of voluntary failure. *Accounting, Business & Financial History*, 18:61–80.
- Ruane, F. (2010). *Report of the Expert Group on Resource Allocation and Financing in the Health Sector*. Dublin: Department of Health and Children.
- Wiley, M.M. (2005). The Irish health system: developments in strategy, structure, funding and delivery since 1980. *Health Economics*, 14:S169–S86.