Independent Hospital Pricing Authority

Technical Specifications 2019-20

National Pricing Model

March 2019

IHPA

National Pricing Model Technical Specifications 2019-20

Contents

Table of acronyms and abbreviations

Acronym/ abbreviation	Description
ABF	Activity Based Funding
ALOS	Average Length of Stay
AN-SNAP	Australian National Subacute and Non Acute Patient Classification
APC	Admitted Patient Care
APCP	Admitted Patient Cost Proportion
AR-DRG	Australian Refined Diagnosis Related Group
ASGS	Australian Statistical Geography Standard
ASNC	Admitted Subacute and Non-acute Care
COAG	Council of Australian Governments
CSO	Community Service Obligation
DoH	Department of Health
DRG	Diagnosis Related Group
DSS	Data Set Specification
DVA	Department of Veterans' Affairs
ED	Emergency Department
HEN	Home Enteral Nutrition
HCP	Hospital Casemix Protocol
ICU	Intensive Care Unit
IHPA	Independent Hospital Pricing Authority
LHN	Local Hospital Network
LOS	Length of Stay
MAPE	Mean Absolute Percentage Error
MBS	Medicare Benefits Schedule
MDB	Major Diagnostic Block, used in Urgency Related Groups
MDC	Major Diagnostic Category, used in AR-DRGs
MPS	Multipurpose Service
NAPED	Non-Admitted Patients Emergency Department
NEC	National Efficient Cost
NEP	National Efficient Price
NHCDC	National Hospital Cost Data Collection
NHRA	National Health Reform Agreement
NMDS	National Minimum Data Set
NPHED	National Public Hospital Establishment Database
NWAU	National Weighted Activity Unit
PHI	Private Health Insurance
PICU	Paediatric Intensive Care Unit
SLA	Statistical Local Area
TAC	Technical Advisory Committee
TPN	Total Parenteral Nutrition
TTR	Teaching, Training and Research
UDG	Urgency Disposition Groups
URG	Urgency Related Groups
WAU	Weighted Activity Unit

1. Overview

1.1. Purpose

This document has been produced as an accompaniment to the National Efficient Price 2019-20 (NEP19) and the National Efficient Cost 2019-20 (NEC19) Determinations. It provides the technical specifications for how the Independent Hospital Pricing Authority (IHPA) developed the Activity Based Funding (ABF) models for the service streams to be funded on this basis from 1 July 2019, and provides guidance to hospitals, Local Hospital Networks (LHN), and state and territory health authorities on how to apply these to hospital activity. It also shows how the NEC is determined for hospitals (such as small rural hospitals) funded on a block funded basis.

1.2. Background

The National Health Agreement (NHRA) sets out the intention of the Australian Government, and state and territory governments to work in partnership to improve health outcomes for all Australians. One of the ways in which the NHRA aims to achieve this is through the implementation of national ABF. The NHRA specifies that the central component of ABF is an independently determined NEP and NEC, to be used as a reference for the Commonwealth to determine its funding contribution for Australian public hospital services.

IHPA is a key element of the NHRA, responsible for the national implementation of an ABF system and in determining the annual NEP and NEC for Australian public hospital services. IHPA was established as an independent government agency under Commonwealth legislation on 15 December 2011. It has issued seven NEP Determinations:

- 2012-13 (NEP12);
- 2013-14 (NEP13 and NEC13);
- 2014-15 (NEP14 and NEC14);
- 2015-16 (NEP15 and NEC15);
- 2016-17 (NEP16 and NEC16);
- 2017-18 (NEP17 and NEC17); and
- 2018-19 (NEP18 and NEC18)

IHPA has now published its eighth NEP and NEC, which sets out the determinations for 2019-20 in relation to each of its legislative functions, namely:

a. The 2019-20 NEP for health care services provided by public hospitals where the services are funded on an *activity* basis;

b. The 2019-20 NEC for health care services provided by public hospitals where the services are funded on a *block funded* basis;

c. The development and specification of classification systems for health care and other services provided by public hospitals;

d. Adjustments to the NEP to reflect legitimate and unavoidable variations in the costs of delivering health care services;

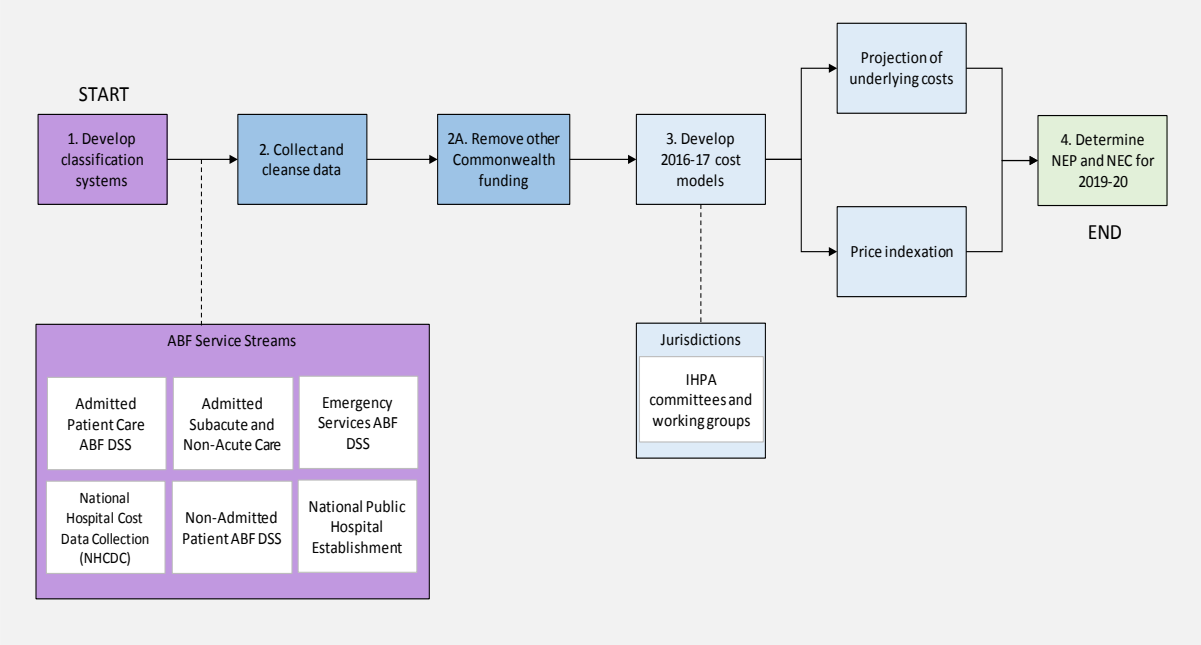
e. Except where otherwise agreed between the Commonwealth and a state or a territory – the public hospital functions that are to be part-funded in that state or territory by the Commonwealth; and

f. Publication of a report setting out the NEP and NEC for the coming year and any other information that would support the efficient funding of public hospitals.

1.3. National Efficient Price 2019-20 process

The figure below outlines the NEP19 process from development of classification systems to publishing the NEP and NEC 2019-20 determinations.

Figure 1: Process to determine the National Efficient Price 2019-20.



1.3.1. Classification systems

One of the first stages is to classify the hospital activity under various systems dependent on the ABF service stream. IHPA has collated activity and cost data for each of the ABF service streams to be funded on an activity basis in 2019-20, as follows:

- Admitted acute;
- Admitted mental health care;
- Admitted subacute and non-acute;
- Emergency care; and
- Non-admitted.

Classification systems within each service stream are applied uniformly across all available data. Although these systems have been developed in part to explain variation in cost between different outputs within the stream, additional systematic variation still occurs. To account for this, various adjustments are modelled and where justified, implemented into the models. The classification systems for each service stream and the source of its cost and activity data are outlined in the Appendix.

1.3.2. Data preparation

An important part of the modelling process is the preliminary preparation of both the costing and activity data. The essential steps in the data preparation process are:

a. A substantial validation process undertaken as the data are received from jurisdictions;

b. Matching mothers with unqualified neonates[1] to ensure costs are properly attributed to the mothers;

c. Linking the NHCDC cost file with the APC activity file at the patient level (which has recorded a success rate of over 99 percent);

d. Identifying any differences in patient characteristics or operational data recorded across the two datasets and reconciling these where appropriate; and

e. Where reported, removing blood costs and/or any identified amounts related to Commonwealth pharmaceutical payments.

The activity and cost data is sourced by IHPA from various national data collections and is supplemented by additional data provided by the states and territories. In consultation with jurisdictions, IHPA has identified 290 hospitals to make up the ABF price model and 406 hospitals designated for block funding. Of the block funded hospitals:

- 20 are being treated separately as specialist psychiatric establishments;
- 11 are major city hospitals;
- 3 do not fit the cost model structure; and
- The 372 remaining block funded hospitals comprise the cost model which remains largely unchanged from NEC18.[2]

Appendix C provides a summary of the NHCDC Round 21 cost data received for 2016-17.

The next stage in the process is to develop the 2016-17 cost models; this includes deriving cost profiles, adjustments and relative weights of classes within each service stream. Developments of the individual cost models are explained in further details in the corresponding sections of this document.

1.3.3. Conversion to a pricing model

There are four steps in the transformation of each year's cost model into its associated pricing model, namely:

a) Identification and exclusion of costs and activity regarded under the National Health Reform Agreement as out of scope for the purpose of ABF.

b) Derivation of a reference cost (or standardised mean) used to transform the cost model into a cost weight model.

c) Derivation of an annual indexation rate used to inflate the cost model to a level reflective of the estimated cost of delivering hospital services in the year of the pricing model.

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[1] See Glossary Item *Newborn qualification status* [METeOR identifier: 327254]

[2] For a list of block funded hospitals see Appendices A to D of the *National Efficient Cost Determination 2019-20*

d) Transformation of the cost model to the pricing model using the results of the previous three steps.

This is explained in further detail in Section 7.

2. Admitted acute care cost model

2.1. General issues

2.1.1. Cost unit

An 'episode of admitted patient care' is the cost unit for admitted acute patients. It is "*the period of admitted patient care … characterised by only one care type*", and covers the period of care from admission to discharge.

2.1.2. In-scope activity

National arrangements for ABF apply to a subset of admitted acute episodes defined by the care type, funding source for the patient and the type of hospital in which the episodes occur. The breakdown for in-scope is illustrated in Table 1.

Table 1: Admitted acute episodes in scope for ABF.

Variable	Episodes that meet the inclusion criteria		
Care type*	1 Acute care 7 Newborn care and qualified days > 0 11 Mental Health		
Funding source/ Election status	**Funding Source (2016-17 codes)**	**Public hospitals**	**Private hospitals**
	01 Health Service Budget (Not covered elsewhere)	Included	Included
	02 Health Service Budget (due to eligibility for Reciprocal Health Care Agreement)	Included	Included
	08 Other hospital or public authority (contracted care)	Included	Included where election status is public
	09 Private Health Insurance	Included	Excluded
	13 Self-funded	Included	Excluded
Hospital size & location	As per the *Determination.*		
Error AR-DRGs	Episodes with an 'error' AR-DRG are not assigned an NWAU. These include AR-DRGs v9 960Z, 961Z, and 963Z.		

*See data element *Care type* [METeOR identifier: 584408]
See object class *Episode of admitted patient care* [METeOR identifier: 268956].

All episodes from all funding sources are included in the calculation of the cost weights. This approach is taken to ensure the sample used for the development of NWAU is maximised and reflects the overall costs for the hospital. Only in-scope patients are included in the calculation of the mean cost used in the development of the NEP. All other episodes (e.g. those funded through the Department of Veterans' Affairs (DVA) and compensable patients) are excluded from the scope of funding.

In-scope costs

Factors impacting on scope of costs include:

- Where a patient is admitted through an emergency department that is within the scope of ABF for emergency care, this component of cost is separated from the acute episode and funded through the emergency care funding model;
- Depreciation and other capital costs[3] (where reported) are removed;
- Indirect costs for teaching, training and research (TTR) are included but any direct TTR costs are excluded and will be block funded; and
- Identified blood costs and Commonwealth pharmaceutical payments are also removed.

2.1.3. Classification

Australian Refined Diagnosis Related Groups (AR-DRGs) are used to classify admitted acute care. The version applying for pricing in 2019-20 is AR-DRG v9.

The 2016-17 activity data used to develop the NEP19 admitted acute cost model is coded using ninth edition ICD-10-AM. Ninth edition coding, introduced on 1 July 2015, disallows the Z50 diagnosis codes as a principal diagnosis. Instead, episodes that would previously have fallen into the Z60 DRGs are allocated to a DRG based on their first valid secondary diagnosis code (for example fractured neck of femur or stroke). As a result, no patients are assigned to Z60A and Z60B DRGs.

2.2. Analysis of costs to derive NWAU for admitted acute care

This section provides an overview of the steps involved in developing the NWAU for admitted acute care. Detailed information in relation to each of the components of the model is included below. In summary, the steps involved in developing the NWAU for admitted acute care are:

a. Prepare data including the removal of other Commonwealth expenditure (in particular the pharmaceutical and blood programs).
b. Incorporate posthumous organ donation activity costs.
c. Incorporate private patient costs.
d. Stratify and weight cost data to activity data.
e. Calculate inlier bounds from activity data.
f. Classify episodes into relevant categories including inliers, short-stay and long-stay outliers, designated same-day AR-DRGs, paediatric status, Indigenous status and remoteness area status, and establishments reporting radiotherapy procedures.
g. Determine cost level for ICU adjustment and deduct associated costs.
h. Derive initial parameters for AR-DRG inlier/outlier model and ensure predicted costs align with actual costs by AR-DRG.
i. Derive paediatric adjustment, specialist psychiatric age adjustment (see Section 3, Mental health care cost model), Indigenous adjustment, remoteness adjustment, radiotherapy adjustment and dialysis adjustment.
j. Derive private patient service adjustment and private patient accommodation adjustment.

[3] "Capital costs are the expenses incurred in acquiring, producing or enhancing non-current (or fixed) assets. They include costs associated with land, buildings, and equipment." Page 74, Hospital Patient Costing Standards - Version 3.1.

k. Incorporate data trimmed in data preparation process (outlier samples of cost data).

l. Convert price weights and assign NWAU.

m. Apply stabilisation of acute weights.

These steps are described in further detail below.

2.2.1. Data preparation

The 2016-17 NHCDC cost data was first adjusted to remove those costs associated with spending under other Commonwealth programs. Costs associated with the Commonwealth's pharmaceutical programs were identified by matching the NHCDC at the patient level with a record of the Commonwealth pharmaceutical payments. The residual unmatched payments were apportioned according to the distribution of costs associated with the matched records. All reported blood costs were removed from the NHCDC. The amounts deducted from the reported costs are identified in Chapter 2 of the NEP19 Determination. Table 2 shows the trimming stages and the number of episodes trimmed at each stage of the data preparation process.

Table 2: Number of episodes trimmed at each data preparation stage.

Trimming stage	Episodes
(a) Initial activity-level cost sample of admitted acute records	**5,773,711**
LESS Total trimmed episodes	**-37,381**
(b) Patient level cost data from one establishment	**-5**
(c) Episodes from hospital-DRG combinations with extremely high or low cost-to-price ratios	**-8,221**
(d) Removal of records with total in-scope costs ≤ $23	**-28,801**
(e) Observations with extreme outlier costs	**-95**
(f) Extremely high or low cost ratios removed after deriving the preliminary regression model	**-227**
(g) multi-day R63Z episodes	**-32**
(h) Resulting sample size of separations used to create AR-DRG cost profiles	**5,736,330**

a. For the financial year 2016-17, an activity-level cost sample of 5,773,711 admitted acute records (with both the admission and separation dates within this period), was partitioned into two groups for modelling purposes. The first group was evaluated as fit for use to develop AR-DRG cost profiles for the 2016-17 cost model, and a second group identified as not fit for this purpose. The second group was later incorporated into the cost model to calibrate the overall level of costs within the model.

b. Patient level cost data from one establishment, totalling 5 episodes, was removed from the sample, based on jurisdictional advice. A preliminary model with length of

stay (LOS) and Diagnosis Related Group (DRG) as explanatory variables of patient cost was derived and applied to the remaining sample.

c. The 516 Hospital-DRG combinations with extremely high or low cost-to-price ratios were also excluded from the patient level modelling.

d. The sample was further reduced by 28,801 episodes as a result of removing records with total in-scope costs (excluding depreciation and ED costs) of $23 or less.

e. The remaining sample was then analysed by AR-DRG, and observations with extreme outlier costs were identified and removed. This was done by ranking observations by cost and identifying those values that recorded an extreme increase in cost over 200 percent (or a decrease in cost of over 75 percent) from the previous observation. In total, 95 records were removed at this stage.

f. The extreme outlier identification stage was undertaken by first deriving a preliminary regression model using LOS and DRG, and analysing the resulting cost ratios. Following this, another 227 individual records with extremely high or low cost ratios were removed.

g. In this final stage, multi-day chemotherapy episodes were trimmed out. The Australian Coding Standards state that the principal diagnosis code *Z51.1 – Pharmacotherapy session for neoplasm* which informs DRG of R63Z may only be assigned to same-day episodes. The 32 multi-day episodes with this code were trimmed from the cost model.

h. The resulting sample of 5,736,330 separations was identified for use in creating AR-DRG cost profiles.

2.2.2. Posthumous organ donation activity costs

Posthumous organ donation activity was accounted for in the NEP for the first time in NEP16. This follows advice from the Organ and Tissue Authority (OTA) that funding provided from the OTA to jurisdictions contributes towards the costs of preparing a patient for organ donation, but not for all costs incurred thereafter. This advice from the OTA means that some of the costs of posthumous organ donation are not funded by the Commonwealth, and this should be in-scope for pricing by IHPA under the NHRA. This has not changed for NEP19.

IHPA takes the costs reported against donors in ‘care type 9’ and redistributes these costs to recipient transplant AR-DRGs in the admitted acute model. The total cost associated with each organ procurement is accounted for by inflating the in-scope cost of patients in AR-DRGs which typically involve transplants of the relevant organ. Note that there is no mechanism to link donors with recipients, or of gauging the success of procurement or transplant.

The total cost reported against posthumous organ donors in 2016-17 is $2,811,976. This results in a national cost inflation in the admitted acute stream of 0.010%.

2.2.3. Private patient costs

Private patient episodes in scope for ABF include those episodes occurring in a public hospital with a funding source of either ‘09 Private health insurance’ or ‘13 Self-funded’ in the 2016-17 data sets. The NHRA requires that in setting NEP19, IHPA must take into account costs of private patients that are met through alternative funding sources. These alternative sources include medical benefits payments by the Australian Government, private health insurance benefits payments and payments made by patients.

A revised methodology was introduced in NEP14 and maintained in NEP15, NEP16, NEP17 and NEP18 to make use of the Hospital Casemix Protocol (HCP) data set, which is reported

by private insurance companies. HCP data identifies both the charges and benefits paid for private patients receiving public hospital services. This method has been used again in the calculation of NEP19; the private patient records in the HCP data were matched with the records in the APC and NHCDC data sets, and this process resulted in a sample of 74.9 per cent matched records. Those private patient records in the NHCDC that were not matched to the HCP data were assumed to have similar characteristics to the matched data set.

Using the HCP data, a more accurate estimate could be made of the amount of private patient costs that were not included in the NHCDC costing data and needed a correction factor applied. A correction factor of 1.4 percent was determined for NEP19.

2.2.4. Stratification and weighting

The sample of costed activity from ABF establishments make up 95.8 percent of all in-scope admitted acute activity (population). To take account of the un-costed activity, IHPA has weighted the costed sample to the population. Weighting of the costed sample has been applied to ensure a true representation of the entire population. This weighting process is performed in two stages, outlined below.

Stage 1 (episodes on or after 1 July 2016)

The first stage of the weighting process stratified and weighted the ABF sample to reflect the population of all 2016-17 ABF admitted acute activity with an admission date *on or after* 1 July 2016. The stratification was based on establishment state/territory, size, location and paediatric specialty. Establishments were classified by size using 2018-19 admitted acute NWAU calculated on 2016-17 activity data (i.e. NWAU18 calculator applied to 2016-17 data).

Stage 2 (episodes prior to 1 July 2016)

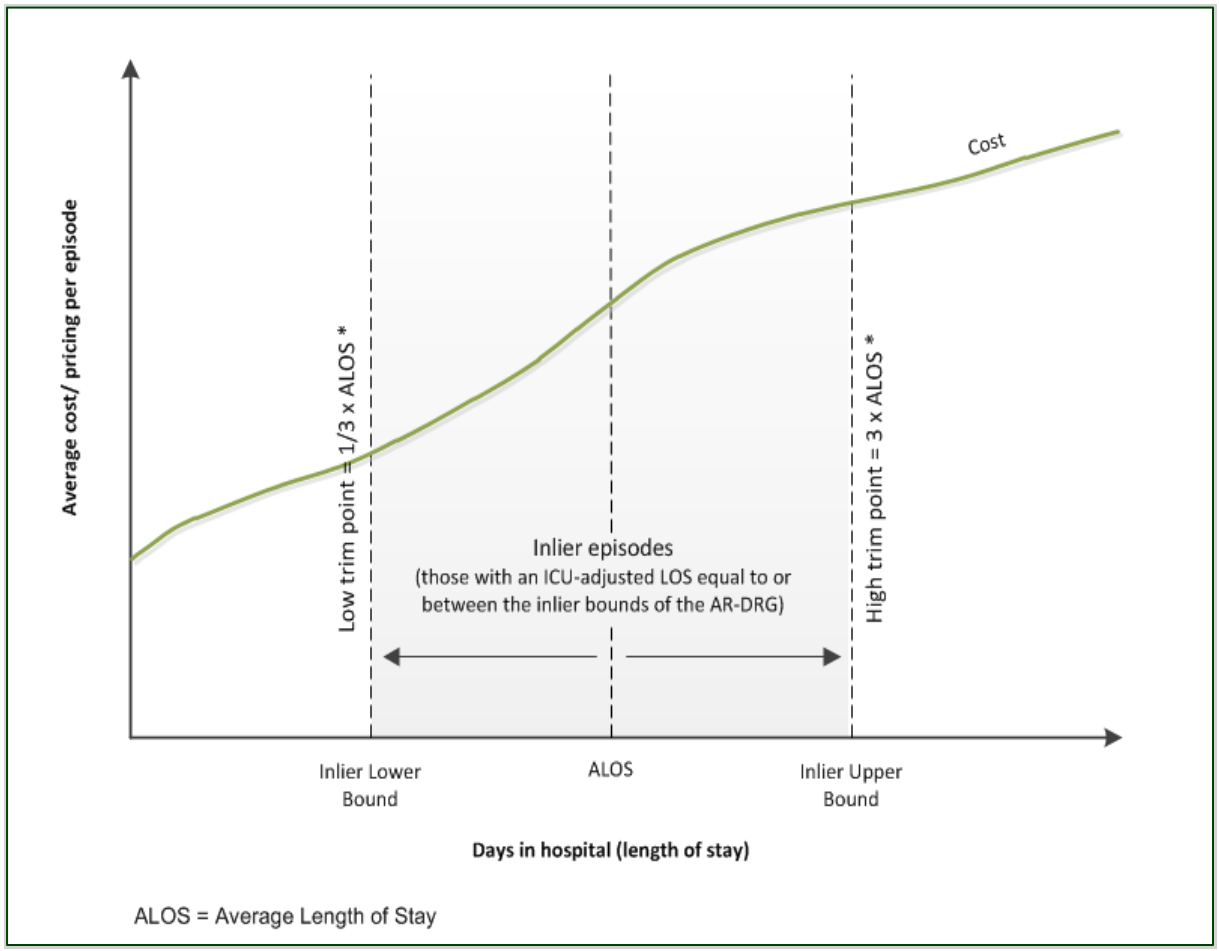
The second stage of the weighting process weighted the 2016-17 activity with an admission date *prior* to 1 July 2016, up to all activity with separation dates within 2016-17. This weighting is done by length of stay (LOS) quartiles within AR-DRG. Same-day activity received a weight of 1 in this process, as there are no 2016-17 same-day separations with admission dates prior to 1 July 2016.

The resulting sample-to-population weights were used throughout all stages of the cost model development.

2.2.5. Inlier bounds

The L3H3 method was applied to the population of in-scope activity from ABF establishments to identify inlier bounds outside of which are short-stay and long-stay outliers, as illustrated in Figure 2. The method excludes same-day episodes occurring in AR-DRGs designated for a separate same-day payment, and uses LOS adjusted to remove ICU days for ICU-unbundled AR-DRGs.

Figure 2: Inlier bound calculations.



L1.5H1.5 was approved for Mental Health Major Diagnostic Categories (MDC) 19 and 20, as well as 11 DRGs that had very high cost long stay outliers. The list of 11 DRGs where the L1.5H1.5 method has been used to determine the inlier bounds is provided in Appendix D.

The steps are:

a. Calculate the national average length of stay (ALOS) for each AR-DRG.

b. Calculate the inlier lower bound for each AR-DRG. This is based on the calculation: national average length of stay divided by 3 (1.5 for Mental Health and the 11 specified DRGs).

   Inlier lower bound = ALOS / 3

   The result was truncated; this means that it was rounded down to the next lowest integer (e.g. if the result was 3.6, the inlier lower bound was set to 3).

c. Calculate the inlier upper bound for each AR-DRG. This is based on the calculation: national average length of stay multiplied by 3 (1.5 for Mental Health and the 11 specified DRGs).

   Inlier upper bound = ALOS x 3

   The result was rounded to the nearest integer (e.g. 10.2 would result in the upper bound being set to 10, whereas 10.7 would result in the upper bound being set to 11).

d. Episodes with an ICU-adjusted LOS equal to or between the two inlier bounds of the AR-DRG to which they belong are considered inlier episodes.

Further to the above process, changes with respect to inlier bounds from the 2015-16 cost model were monitored to ensure they were the result of real change and were not due to statistical noise. Wherever an AR-DRG has not been significantly affected by a specific change in methodology, 95 percent confidence intervals around bounds are used to evaluate changes as significant or not. Changes are also evaluated in terms of their materiality (required to affect at least 1 percent of an AR-DRG's separations and at least 10 separations).

2.2.6. Classification of patient-level cost data in relevant categories

Prior to analysing costs, episodes are assigned to categories reflecting the relevant adjustments to be made through the 2016-17 cost model. The steps involved include:

a. *Assigning one of the following categories to each episode:*
   - Same-day separation from an AR-DRG on the Designated Same-Day Payment list;
   - Short stay outlier;
   - Inlier;
   - Long stay outlier.

b. *Flagging episodes that are eligible for the paediatric adjustment.* These are episodes that:
   - Occur in establishments identified as delivering specialised paediatric services (listed in Appendix E the NEP19 Determination);
   - Have an AR-DRG which is not within MDC 15 (Newborns and other neonates); and
   - Have patient age at admission of 17 years or less.

c. *Flagging episodes that are eligible for the specialist psychiatric age adjustment.* These are episodes that have patient psychiatric care days and fall within the age categories specific to the adjustment (see Section 3, Mental Health Care Cost Model). Together with all the episodes in MDCs 19 and 20 (Mental Diseases and Disorders, and Alcohol/Drug Use and Alcohol/Drug Induced Organic Mental Disorders respectively), these episodes are considered part of the mental health model and are explained in Section 3.

d. *Flagging episodes that are eligible for the Indigenous adjustment.* These are episodes with Indigenous status[4] of Aboriginal and/or Torres Strait Islander origin.

[4] See data element *Indigenous status* [METeOR identifier: 291036].

e. *Flagging episodes that are eligible for the patient residential remoteness adjustment.* These are episodes where the patient's place of usual residence has been assigned to a remoteness area[5] of:

- RA2 - Outer Regional Australia;
- RA3 - Remote Australia; and
- RA4 - Very Remote Australia.

Three flags are used: one for outer regional Australia, one for remote Australia and one for very remote Australia. The remoteness area of the usual residence of a patient is determined using the following process:

i. The patient's ASGS SA2 code is mapped to remoteness areas.

ii. If the supplied SA2 code is missing or invalid, the patient's postcode of usual residence is used.

iii. If the postcode is missing or invalid, then the supplied SLA code is used.

iv. If the SLA code is also missing or invalid, then the remoteness area of the hospital is used. The remoteness code of the hospital is based on the remoteness area of the ABS collection district within which the hospital is located.

f. *Flagging episodes that are eligible for the radiotherapy adjustment.* These are episodes where the patient is eligible if they have recorded a radiotherapy-related procedure as defined in Appendix B of the NEP19 Determination.

g. *Flagging episodes that are eligible for the dialysis adjustment.* These are episodes where the patient is eligible if they are outside the specified dialysis AR-DRGs L61Z and L68Z, and have recorded a dialysis-related procedure as defined in Appendix C of the NEP19 Determination.

h. *Flagging episodes that are eligible for the patient treatment remoteness adjustment.* These are episodes where the hospital of treatment has a remoteness area of

- RA3 - Remote Australia; and
- RA4 - Very Remote Australia.

i. *Flagging episodes eligible for ICU adjustment.* These are episodes that occur in hospitals identified by IHPA as eligible for ICU adjustment as defined in Appendix D of the NEP19 Determination and have an AR-DRG not on the Bundled ICU list (i.e. not from MDC 15 for newborns and other neonates).

j. *Flagging private episodes.* These are episodes with a funding source[6] of '09 Private health insurance' or '13 Self-funded'.

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[5] Remoteness areas are defined in the *Australian Standard Geographic Standard (ASGS),* which is maintained by the Australian Bureau of Statistics (see: www.abs.gov.au). The 2011 ASGS Remoteness Area classification was used to classify patients' place of residence and locality of hospitals.

[6] For activity data before 2012-13 see data element *Principal source of funding (Funding source for hospital patient)* [METeOR identifier: 339080], values: 01 Australian Health Care Agreements; 02 Private health insurance; 10 Other hospital or public authority (contracted care); 11 Reciprocal health care agreements (with other countries); 12 other. See Table 3 for relevant codes in 2017-18.

k. *Flagging Hospital Acquired Complications (HACs)*. These are episodes that are identified as having a hospital acquired complication as specified by the Australian Commission on Safety and Quality in Health Care (ACSQHC) on their website.

2.2.7. Determine ICU adjustment level and deduct associated costs

Patient-level cost data for episodes in hospitals with an eligible ICU or Paediatric ICU (PICU) with ICU hours reported are analysed to estimate an average cost per ICU hour. The eligible ICUs and PICUs are those belonging to hospitals that report more than 24,000 ICU hours and have more than 20 percent of those hours reported with the use of mechanical ventilation. The specified hospitals with eligible ICUs and/or PICUs are listed at Appendix D of the NEP19 Determination. A total sample of 83,941 separations with ICU hours and costs from establishments with eligible ICUs/PICUs was used.

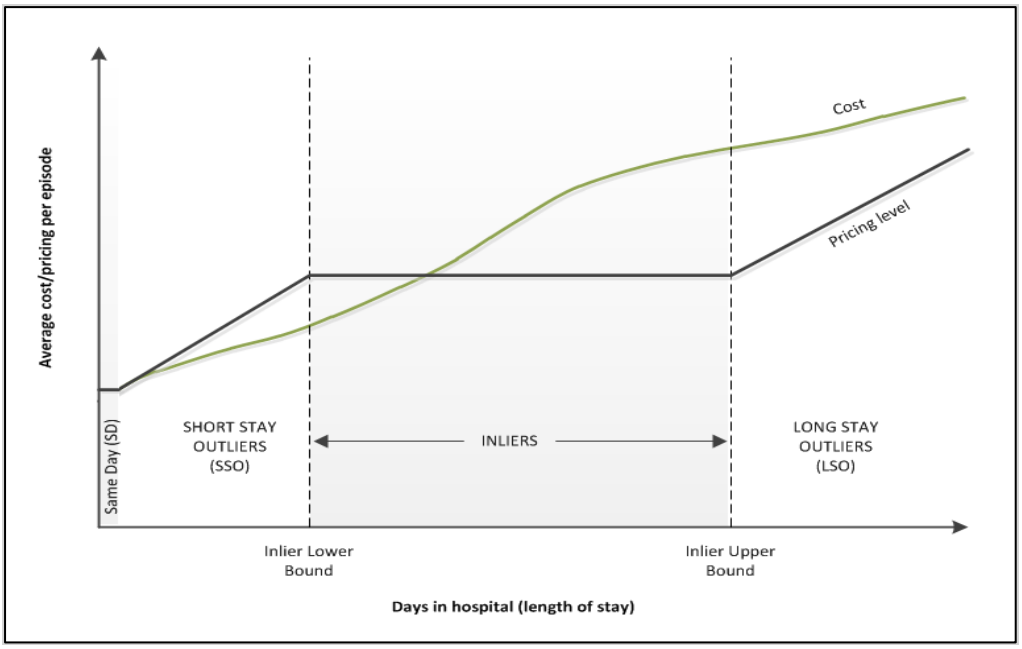
Linear regression by state/territory was used to derive state/territory hourly ICU costs. DFFITS statistics are used to exclude overly influential observations. The weighted mean of the hourly ICU costs taken across states was used to derive a national ICU rate of $210.

For ICU-eligible episodes, an ICU adjustment is calculated using the estimated ICU cost per hour and the reported number of whole ICU hours. This amount is deducted from the in-scope costs used for modelling the same-day payment AR-DRG, short stay outlier, inlier and long stay outlier costs and associated adjustments, but added back in for the ICU adjustment. Whole ICU days are also removed from each eligible episode's LOS.

2.2.8. DRG inlier/outlier model

Figure 3 illustrates the general form of the cost model within each AR-DRG. However, an AR-DRG's form may differ depending on whether it has a designated same-day separation category, a short-stay outlier category, or a long-stay outlier category.

Figure 3: Initial parameters for the assignment of cost weights.



Initial parameters are derived for designated same-day payment AR-DRG episodes, short-stay outlier episodes, inlier episodes, and long-stay outlier episodes. The steps involved are as follows:

a. *Designated same-day AR-DRG episodes:* calculate the mean cost per episode.

b. *Inlier episodes:* calculate the mean cost per episode.

c. *Short-stay outlier episodes:* calculate the base cost as the average of total Operating Room, SPS and Prosthesis costs, and then calculate the cost per diem to ensure an even growth in cost to that of the inlier episode.

d. *Long-stay outlier episodes.* The mean inlier cost is assigned to each episode as a base amount. A per diem for each outlier day is calculated using one of two methods:

- In AR-DRGs where the LOS profile was adequately wide enough and regular to allow robust regression analysis to be undertaken, the per diem cost was taken as the LOS regression coefficient; this process excluded designated same-day episodes and overly influential observations (as determined by the DFFITS statistical measure).
- In the remaining AR-DRGs, cost buckets were partitioned into 'fixed' and 'variable' (similar to the short-stay outlier process for surgical AR-DRGs), and the per diem cost was taken as the mean variable cost per patient day.

Where there are fewer than 100 separations in an AR-DRG the 2016-17 separations are combined with those from 2015-16, indexed appropriately, to calculate the cost parameter. All AR-DRG parameters are then uniformly calibrated to ensure the modelled costs are equalised against actual costs.

2.2.9. Calculation of additional adjustments

After the AR-DRG inlier/outlier model was derived, the following five sets of adjustments were calculated based on factors considered to have a material impact on the cost of acute services.

Paediatric adjustment

A paediatric adjustment is derived by AR-DRG using a process similar to the 2015-16 admitted acute cost model. Specialised paediatric patients are identified as being less than or equal to 17 years of age, from an establishment identified as delivering specialised paediatric services (listed in Appendix E of the NEP19 Determination as Specialised Children's Hospitals), and excluding AR-DRGs from MDC 15 (newborns and other neonates).

The paediatric adjustment for each AR-DRG is:

a. Rounded to the nearest whole percent;

b. Capped and floored at 2.0 and 0.8 respectively; and

c. Set to 1 (i.e. no adjustment) if the adjustment was less than 0.05 either side of 1.

Further to this, the paediatric adjustment for the 2016-17 cost model is compared against that of the 2015-16 cost model and changes are stabilised for AR-DRGs where either of the cost data samples (i.e. paediatric or non-paediatric) contain fewer than 500 observations. This stabilisation involves taking the average adjustment across the two years.

The cost parameters of each AR-DRG are then calibrated to ensure that the modelled costs, with paediatric adjustment applied, are equal to the actual costs of the AR-DRG.

Specialist psychiatric age adjustment

See Section 3 (Mental health care cost model).

Indigenous adjustment and patient residential remoteness adjustment

These adjustments are derived in the same way since the 2009-10 cost model:

a. The remoteness value for each episode is derived from an episode's available geographical information in the following order of preference: SA2, postcode, SLA value, or the hospital geographical indicator variable.

b. A multivariate least squares weighted regression model is used to estimate the extent to which Indigenous status and remoteness of a patient's usual residence explains the variation in the mean cost per weighted episode. Episodes are weighted to control the level to which the model already explains costs (i.e. through the AR-DRG inlier/outlier model together with the paediatric and specialist psychiatric age adjustments). The coefficients estimated from this model indicate the extent to which Indigenous status and remoteness of a patient's usual residence explains residual variation in costs.

c. The analysis yields an adjustment for Indigenous patients and three adjustments for patients residing in outer regional, remote and very remote areas.

d. The adjustments are additive where more than one adjustment applies, for example, where an Indigenous patient resides in a remote area, an adjustment equal to the addition of the Indigenous and remoteness adjustments is applicable.

Radiotherapy and dialysis adjustment

The dialysis adjustment is derived in the same way as in the 2012-13, 2013-14, 2014-15 and 2015-16 cost models and at the same time as the Indigenous and remoteness adjustments. Together with the radiotherapy adjustment, the adjustments compensate for the extra costs of dialysis-related and radiotherapy-related procedures, as specified in Appendices B and C of the NEP19 Determination. These two adjustments are additive with the Indigenous and remoteness adjustments.

Patient treatment remoteness adjustment

The patient treatment remoteness adjustment was introduced in the NEP18 Determination. It is derived using the same methodology as the residential remoteness adjustment, and is designed to explain the residual variation in cost after the other adjustments have been applied. The analysis yields an adjustment for remote and very remote treatment locations.

AR-DRG cost parameters are then uniformly calibrated to ensure cost neutrality of the model (including Indigenous, remoteness, radiotherapy and dialysis adjustments) against actual costs.

2.2.10. Private patient adjustments

Further adjustments are applied to private patients to account for the private benefit received from MBS and private insurers. These adjustments cover the service and accommodation of private patients.

Private patient service adjustment

The HCP data provides a more accurate amount of benefits received from MBS and private insurers for medical hospital services and prostheses than provided by the NHCDC. These benefits are used to calculate the private patient service adjustment. The adjustment is calculated at the AR-DRG level, although for some AR-DRGs with small samples, the adjustment is derived at a more aggregate level.

The following ratio was taken at the AR-DRG level:

$$\text{Private patient service adjustment } (A_{PPS}) = \text{Removed costs / Total AR-DRG model costs}$$

It should be noted that the AR-DRG model costs referred to in this document exclude the application of any other adjustments. That is, the private patient service adjustment *(*A_{PPS}*)* is calculated in such a way that excludes any effect on the paediatric, specialist psychiatric, Indigenous, remoteness, and radiotherapy or dialysis adjustments.

The AR-DRG cost parameters are then uniformly calibrated to ensure cost neutrality of the cost model (including the private patient service adjustment and previously derived adjustments) against actual costs.

Private patient accommodation adjustment

In addition to medical and prostheses costs, insurers are also charged for accommodation. A private patient accommodation adjustment (A_{Acc}) is applied to account for revenue received in relation to these charges. For the purpose of deriving the adjustment associated with NEP19, 2018-19 average default benefits for private health insurers by state/territory are indexed forward one year by 2.25 percent (i.e. by CPI as required by legislation) to 2019-20.

2.2.11. Funding adjustment for Hospital Acquired Complications

The August 2016 Ministerial Direction required IHPA to develop an approach for the funding of episodes which have a Hospital Acquired Complication (HAC). The approach developed by IHPA takes the form of an extra adjustment included in the calculation of NWAU, so has been included in the NWAU calculation formulas in this document.

A detailed explanation of the funding adjustment can be found in the accompanying document *Pricing and Funding for Safety and Quality – Risk Adjustment Model for Hospital Acquired Complications* published by IHPA.

2.2.12. Incorporation of outlier samples of cost data

The development of the cost model to this point is based on the sample of patient-level cost data evaluated as fit for use to develop AR-DRG cost profiles. Thus, the sample of patient-level cost data identified as not fit for use at the AR-DRG level have not been used within the cost model.

The following process is used to calibrate the cost model against the entire sample of cost data:

a. The cost model developed to this point, including all adjustments (except the private patient adjustments) is applied to the entire cost data sample. This process results in model costs across the entire sample of cost data.

b. The AR-DRG cost parameters are then uniformly adjusted to ensure the resulting total modelled cost across the entire sample is equalised against the total actual costs of the entire sample.

It should be noted again that sample-to-population weights are used throughout all stages in the development of the cost model.

2.2.13. Price weights and NWAU

The final step in the process involves the conversion of the 2016-17 cost model parameters to cost weight values by dividing the cost parameters by a reference cost.

The reference cost used was the 2015-16 reference cost indexed one year by the growth rate in the consecutive years' cost models, where this growth rate is standardised against the

2016-17 activity data. Specifically, the standardised growth rate was derived by applying the 2015-16 and 2016-17 cost models (excluding private patient adjustments) to the 2016-17 activity data, and calculating the change in total modelled costs between the two models.

For NEP19 the standardised growth rate calculation included an adjustment to the 2015-16 activity data to account for a substantial shift in diagnosis coding in the 2016-17 activity data, which is discussed further in Section 7.3. With the exception of this adjustment, the standardised growth rate calculation follows the same methodology used to calculate the 2015-16 reference cost from the 2014-15 reference cost.

The resulting cost weights are then converted to the price weights that are used to assign NWAU, as explained further in Section 7.

2.2.14. Stabilisation of acute weights

The *National Pricing Model Stability Policy* states that inlier price weight movements between years will be capped to ±20% for AR-DRGs deemed comparable between years where the impact will be minimal. See the *Stability Policy* on the IHPA website for specific details on stability criteria.

Stabilisation of inlier weights is done simultaneously. An adjustment factor is calculated for each cost parameter so that the associated price weight is ±20% of the previous year's price weight.

This adjustment factor is then applied to the same-day, short-stay base, and short-stay outlier per diem weights if they exist. Long-stay outlier per-diem weights are not scaled in this way in order to avoid potential unintended extreme cost ratios for very long stay outliers. The entire cost model is then recalibrated to ensure that the total actual costs and the total modelled costs are equal across the entire sample.

2.3. Applying the NEP

As set out in the NEP19 Determination, the price of an ABF Activity is calculated using the following formula, with adjustments applied as applicable:

Price of an admitted acute ABF activity

$$= (\{[\mathrm{PW} \times \mathrm{A_{Paed}} \times (1 + \mathrm{A_{SPA}}) \times (1 + \mathrm{A_{Ind}} + \mathrm{A_{Res}} + \mathrm{A_{RT}} + \mathrm{A_{Dia}}) \times (1 + \mathrm{A_{Treat}}) + (\mathrm{A_{ICU}} \times \mathrm{ICU\ hours})] - [(\mathrm{PW} + \mathrm{A_{ICU}} \times \mathrm{ICU\ hours}) \times \mathrm{A_{PPS}} + \mathrm{LOS} \times \mathrm{A_{Acc}}]\} - \mathrm{PW} \times \mathrm{A_{HAC}}) \times \mathrm{NEP}$$

Where:

A_{Paed}	means the *Paediatric Adjustment*
A_{SPA}	means the *Specialist Psychiatric Age Adjustment*
A_{Res}	means each or any *Patient Residential Remoteness Area Adjustment*
A_{Ind}	means the *Indigenous Adjustment*
A_{RT}	means the *Radiotherapy Adjustment*
A_{Dia}	means the *Dialysis Adjustment*
A_{Treat}	means the *Patient Treatment Remoteness Area Adjustment*
A_{ICU}	means the *Intensive Care Unit (ICU) Adjustment*
A_{PPS}	means the *Private Patient Service Adjustment*

A_{Acc}	means the *Private Patient Accommodation Adjustment* applicable to the state of hospitalisation and length of stay
A_{HAC}	means the *Hospital Acquired Complications Adjustment*
ICU hours	means the number of hours spent by a person within a *Specified ICU*
LOS	means length of stay in hospital (in days)
NEP	National Efficient Price 2019-20
PW	Price Weight for an ABF activity as set out at Appendix H of the NEP19 Determination

In the event that the application of the private patient adjustments return a negative NWAU(19) value for a particular patient, the NWAU(19) value is held to be zero; that is, negative NWAU(19) values are not permitted for any patients under the National Pricing Model.

The table below outlines the required information in order to apply the above formula.

Table 3: Dataset and tables required for assignment of NWAU to admitted acute patient data.

Input dataset or table	Description
APC NMDS	Dataset based on the 2016-17 Admitted Patient Care National Minimum Data Set (APC NMDS).
ICU Rate and Paediatric Adjustment eligibility table	Table listing establishments with an eligible ICU or PICU, found in the NEP19 Determination and Glossary.
Postcode table	Table of postcodes mapped to the 2011 ASGS Remoteness Area classification. Each postcode is mapped to the Remoteness Area category within which the majority of the postcode's population resides. PO Box postcodes are mapped to the Remoteness Area category within which the Post Office is located.
ASGS table	Table of Australian Statistical Geography Standard (ASGS) mapped to the Remoteness Area category within which the majority of the ASGS's population resides.
SLA table	Table of Statistical Local Areas (SLAs) mapped to the 2011 ASGS Remoteness Area classification. Each SLA is mapped to the Remoteness Area category within which the majority of the SLA's population resides.
2019-20 NWAU Price Weight table	2019-20 Admitted acute NWAU Price Weight table, found in the NEP19 Determination.
2019-20 NWAU Adjustments	2019-20 Admitted acute NWAU Adjustments, found in the NEP19 Determination.

Table 4: APC NMDS variables used to calculate 2019-20 admitted acute NWAU.

APC NMDS Variable
State Identifier

APC NMDS Variable
Establishment Identifier
Hospital geographical Indicator
Sex
Date of Birth
Date of Admission
Date of Separation
Care Type
Admission Mode
Admission Urgency Status
Number of Qualified Days for Newborns
Total Psychiatric Care Days
Indigenous Status
Funding Source[7]
Diagnosis Related Group v9.0
Total Leave Days
Total Hours spent in Intensive Care Unit
Postcode of Patient's Usual Residence
Australian Statistical Geography Standard (ASGS) of Patient's Usual Residence
Statistical Local Area of Patient's Usual Residence
Either the identifier signifying radiotherapy treatment/planning or the list of patient's ICD-10-AM procedure codes.
Either the identifier signifying dialysis or the list of patient's ICD-10-AM procedure codes.
The list of patient's ICD-10-AM codes, including diagnoses and condition onset flags.

[7] Data element *Funding source for hospital patient* [METeOR identifier: 553314]

3. Mental health care cost model

3.1. General issues

3.1.1. Cost unit

An 'episode of admitted patient care'[8] is the cost unit for mental health patients. As for NEP18, mental health patients are specifically defined as only those admitted acute patients that are:

- In MDC 19 (Mental Diseases and Disorders);
- In MDC 20 (Alcohol/Drug Use and Alcohol/Drug Induced Organic Mental Disorders); and
- Those patients in other MDCs that have recorded psychiatric care days.

As such, admitted acute mental health patients are a subset of admitted acute patients and are analysed under the admitted acute cost model.

Mental health patients receiving ED and non-admitted care services are not differentiated in the NEP19 and so receive payments as defined for the relevant ABF product category.

3.1.2. In-scope activity

Mental health admitted care is that provided to patients who undergo a facility's formal admission[9] processes where the clinical intent or treatment goal is the provision of acute care. In-scope hospitals and patients are defined the same way as in the admitted acute model (see Section 2.1.2).

3.1.3. Classification

AR-DRGs are used to classify admitted acute care including the mental health acute patients. The version that applies for funding in 2019-20 is AR-DRG v9.0.

3.2. Analysis of costs to derive NWAU for mental health care

3.2.1. Data preparation

See Section 2.2.1.

3.2.2. Stratification and weighting

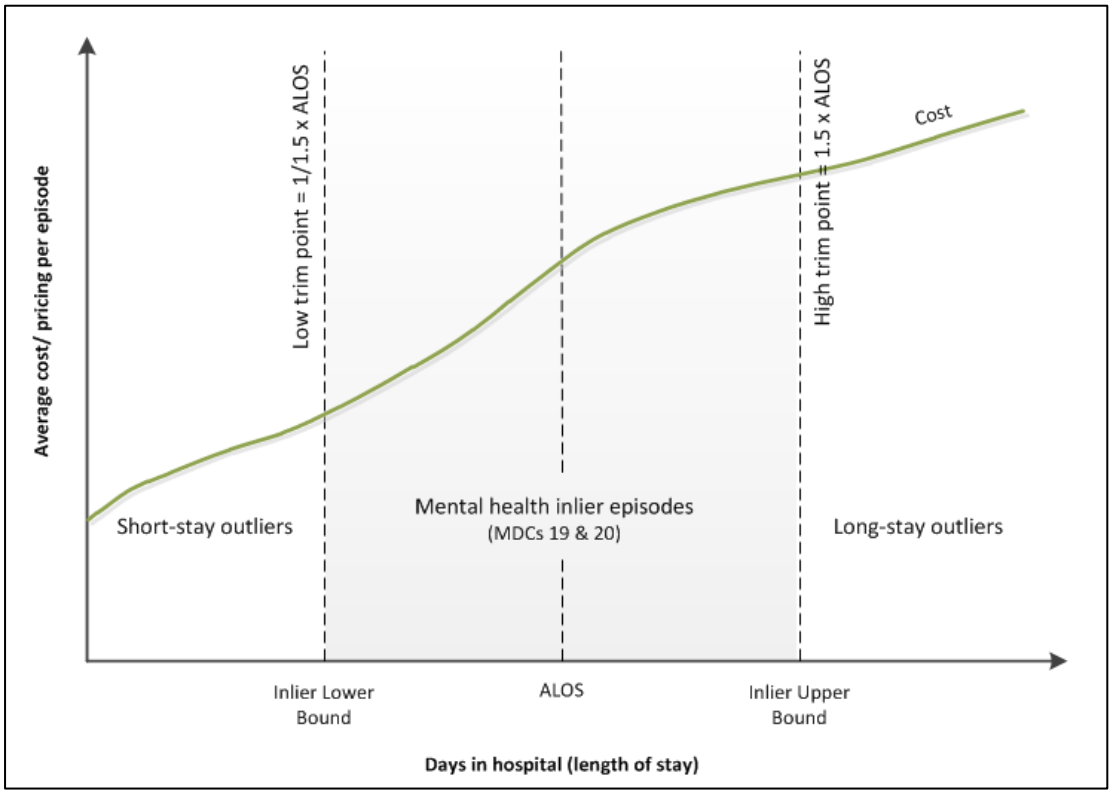
See Section 2.2.4.

[8] See object class *Episode of admitted patient care* [METeOR identifier: 268956].
[9] See glossary item *Admission* [METeOR identifier: 327206].

3.2.3. Inlier bounds

The inlier bounds for AR-DRGs within MDCs 19 and 20 were set using the L1.5 H1.5 [10] trimming method, as shown in Figure 4, while the majority of other MDCs in the admitted acute cost model remained at L3H3.

Figure 4: Inlier bound calculations for mental health using the L1.5H1.5 trimming method.



These narrower inlier bounds resulted in a lower proportion of inliers and a corresponding higher proportion of short-stay and long-stay outliers, as shown in Table 5.

Table 5: MDCs 19 & 20 (Mental health) – activity and cost distribution.

	Short-Stay Outlier	Inlier	Long-Stay Outlier
Separations	37%	51%	12%
Patient Days	15%	31%	54%
Actual Costs	19%	34%	48%

Note: *Same-day payment separation category has been combined with the short-stay outlier category.*

Table 6 illustrates the distribution of activity and costs across the medical AR-DRGs.

[10] L1.5H1.5 refers to the trimming method in which the low trim point is the average length of stay (ALOS) divided by 1.5, and the high trim point is 1.5 times the ALOS.

Table 6: Medical AR-DRGs excluding MDC 19 & 20 – activity and cost distribution.

	Short-Stay Outlier	Inlier	Long-Stay Outlier
Separations	10%	89%	1%
Patient Days	5%	83%	13%
Actual Costs	6%	85%	10%

Note: *Same-day payment separation category has been combined with the short-stay outlier category.*

Applying the narrower inlier bounds to MDCs 19 and 20 significantly improves the explanatory power of the AR-DRG inlier/outlier model for mental health patients to a level comparable to the model applied across all other activity.

3.2.4. Cost parameters and adjustments

The cost parameters of the AR-DRG inlier/outlier model that apply to mental health patients are calculated in the same way as those for admitted acute patients. The resulting cost parameters for mental health patients differ to the extent that MDCs 19 and 20 use L1.5H1.5 to define the inlier bounds.

The calculation and application of the adjustments are broadly similar to the admitted acute model, with a number of important differences. Empirical evidence was analysed for a number of mental health specific adjustments on the advice of the IHPA Mental Health Working Group. The cost analysis was undertaken in preparation for NEP15 and the age groups have been modified from those used in NEP14. The age groups adopted in NEP15 have been used in NEP19.

The different adjustments for mental health patients are as follows:

- Patients with registered psychiatric care days are identified and broken into five age groups, with the following two groups exhibiting significantly higher costs, making them eligible for adjustment:
    - Less than or equal to 17 years; and
    - Greater than 17 years *and* not in MDCs 19 and 20.
- Patients with age less than or equal to 17 years with registered psychiatric care days are further divided into two groups; those that have received care in one of the ten specialist paediatric hospitals, and those that have not.
- Specialist psychiatric age adjustments are derived from the age categories, as set out in Table 1 of the NEP19 Determination.
- Mental health patients also accrue other relevant adjustments that apply to admitted acute patients.

3.2.5. Price weights and NWAU

See Section 2.2.13.

3.3. Apply the NEP

See Section 2.3.

4. Admitted subacute and non-acute care cost model

4.1. General issues

4.1.1. General issues cost unit

An 'episode of admitted patient care'[11] is the cost unit for admitted subacute and non-acute patients. It is "*the period of admitted patient care … characterised by only one care type*" [12], and covers the period of care from admission to separation.

4.1.2. In-scope activity

Admitted subacute and non-acute care is that provided to patients who undergo a facility's formal admission[13] process, where the clinical intent or treatment goal is the provision of subacute or non-acute care.

In-scope hospitals and patients are defined the same way as for admitted acute patients, except that the patients are admitted into a care type for subacute or non-acute care.

4.1.3. Classification

Version 4 of the Australian National Subacute and Non-Acute Patient Classification (AN-SNAP v4) is used to classify admitted subacute and non-acute care. Where data on AN-SNAP classification is not available, the episodes are moved into the admitted acute care cost model.

4.1.4. Outline of methodology for NEP19

- Paediatric palliative care classes 4G02 (Palliative Care, Stable phase, Age >=1 year) and 4G03 (Palliative Care, Unstable or Deteriorating phase, Age >=1 year) are priced using AN-SNAP classes as sufficient phase level paediatric palliative care data was available. Other paediatric palliative care will continue to be priced using per diems as per NEP18.
- All episodes without a legitimate AN-SNAP classification have been transferred to the acute care model and paid according to their DRG classification, with the exception of paediatric palliative care episodes which are priced as per the above methodology.
- The stabilisation methodology was consistent with the acute admitted model and used to ensure any changes in bounds were the result of real change and were not due to statistical noise. 95 percent confidence intervals around bounds are used to evaluate changes as significant or not. Changes are also evaluated in terms of their materiality (required to affect at least 1 percent of AN-SNAP separations and at least 10 separations).
- The pricing stability policy has been applied to restrict year-to-year movement to a maximum of 20 percent when there is no change in inlier bounds and there are less than 1000 episodes. This policy has been applied to three same day AN-SNAP weights in the model in the sub-acute model.

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[11] See object class *Episode of admitted patient care* [METeOR identifier: 268956].
[12] Ibid.
[13] See glossary item *Admission* [METeOR identifier: 327206].

4.2. Analysis of costs to derive NWAU for subacute admitted care

The following steps are taken in developing the cost parameters and weights for admitted subacute and non-acute care:

a. Data preparation;
b. Develop sample-to-population weights;
c. Classify AN-SNAP episodes into relevant categories: inliers, short-stay and long-stay outliers using the ABF L1.5H1.5 methodology;
d. Apply Indigenous and remoteness adjustments inherited from the admitted acute care cost model; and
e. Derive private patient service adjustments for each care type.

These steps are described in more detail in the following sections.

4.2.1. Data preparation

The 2016-17 admitted subacute cost sample consists of the following groups in Table 7:

Table 7: Admitted subacute cost sample breakdown.

Group	Establishments	Total Records	Total Days
Total NHCDC Sample	241	195,745	2,519,127
AN-SNAP Classified data	234	172,709	2,276,116

As in the admitted acute care cost model, HCP data was used to correct for the missing private patient costs in the NHCDC, as well as for subsequent estimates of private patient service adjustments (see Section 2.2.10).

The data was trimmed for extreme outliers using similar methodology to the admitted acute care cost model. The following data was not used to derive the AN-SNAP v4 cost profiles:

- Paediatric Palliative Care Records;
- Records that had an in-scope cost of $0;
- Records with an Error or Ungroupable AN-SNAP v4 class;
- Non-phase adult palliative care separations;
- Extreme cost outliers within an AN-SNAP v4 class.

4.2.2. Stratification and weighting

The sample of AN-SNAP classified data was weighted to account for the fact that the used sample excludes all activity with an admission date prior to 1 July 2016.

4.2.3. Determining AN-SNAP Version 4 cost parameters

The AN-SNAP cost model parameters comprise the following:

- *Same day price weight:* applicable to records within a same day SNAP class or admitted and discharged on the same day in a palliative care type.
- *Short stay outlier per Diem rate:* applicable to records that are not same day and have a length of stay shorter than the lower bound.

- *Inlier episodic rate:* applicable to records with a length of stay within the upper and lower bound of the specific AN-SNAP v4 class.
- *Long stay outlier per Diem rate:* applicable to records with a length of stay longer than the specified upper bound.

4.2.4. Calculation of additional adjustments

The following adjustments were derived within the admitted subacute cost model:

- *Private patient service adjustment:* This adjustment is calculated by care type in the same way as it is calculated by AR-DRG within the admitted acute cost model.
- *Private patient accommodation adjustment:* This adjustment is identical to that of the admitted acute cost model (see Section 2.2.10).

The following adjustments were derived within the admitted acute cost model and applied in the subacute stream for the first time in NEP19:

- Radiotherapy adjustment;
- Dialysis adjustment; and
- Patient treatment remoteness adjustment.

The proportion of NHCDC activity for which the adjustments apply are as follows:

- The Indigenous adjustment applied to 1.6 percent of subacute activity;
- The residential remoteness adjustment applied to 6.4 percent of subacute activity;
- The radiotherapy adjustment applied to 0.5 percent of subacute activity;
- The dialysis adjustment applied to 0.7 percent of subacute activity;
- The treatment remoteness adjustment applied to 0.2 percent of subacute activity; and
- The private patient adjustments applied to 24.4 percent of subacute activity.

The cost model (including all adjustments except the private patient adjustments) was then calibrated to ensure model costs are equalised against actual costs.

4.2.5. Calculation of paediatric care type per diem

As outlined in Section 4.1.4, the paediatric palliative care type (excluding AN-SNAP classes 4G02 and 4G03) has a single rate due to insufficient data being available to determine prices at the AN-SNAP class level. This rate is determined by dividing the average cost by the average LOS for episodes in the remaining paediatric palliative care AN-SNAP classes.

4.2.6. Subacute and non-acute stabilisation

Refer to Section 2.2.14 for information about the stabilisation process. The same methodology has been applied to the admitted subacute and non-acute cost model.

4.2.7. Price weights and NWAU

The conversion of cost parameters to price weights involves dividing the dollar-valued cost parameters by the reference cost (from the admitted acute care cost model) to obtain cost weights. The same reference cost is used across all streams of activity and is discussed in Section 7.

4.3. Applying the NEP

As set out in the NEP19 Determination, the price of an ABF admitted subacute activity is calculated using the following formula, with adjustments applied as applicable:

Price of an admitted subacute ABF activity

$$= \{[\mathrm{PW} \times (1 + \mathrm{A_{Ind}} + \mathrm{A_{Res}} + \mathrm{A_{RT}} + \mathrm{A_{Dia}}) \times (1 + \mathrm{A_{Treat}})] - [\mathrm{PW} \times \mathrm{A_{PPS}} + \mathrm{LOS} \times \mathrm{A_{Acc}}]\} \times \mathrm{NEP}$$

Where:

A_{Ind}	means the *Indigenous Adjustment*
A_{Res}	means each or any *Patient Residential Remoteness Area Adjustment*
A_{RT}	means the *Radiotherapy Adjustment*
A_{Dia}	means the *Dialysis Adjustment*
A_{Treat}	means the *Patient Treatment Remoteness Area Adjustment*
A_{PPS}	means the *Private Patient Service Adjustment*
A_{Acc}	means the *Private Patient Accommodation Adjustment* applicable to the state of hospitalisation and length of stay
LOS	means length of stay in hospital (in days)
NEP	National Efficient Price 2019-20
PW	means the Price Weight for an ABF Activity as set out in Appendix I and J of the NEP19 Determination

In the event that the application of the private patient accommodation adjustment and the private patient service adjustment returns a negative NWAU value for a patient, the NWAU value is held to be zero, as negative NWAU values are not permitted for any patients under the National Pricing Model.

The table below outlines the required information in order to apply the above formula.

Table 8: Datasets and tables used for assignment of NWAU to admitted subacute patient data.

Input dataset or table	Description
APC NMDS & ASNHC DSS	Dataset based on the 2019-20 Admitted Patient Care National Minimum Data Set (APC NMDS), with extra AN-SNAP information from the Admitted Subacute and Non-acute hospital care DSS (ASNHC DSS), where available. Dataset specifications are located on the IHPA website.
Postcode table	Table of postcodes mapped to the 2011 ASGS Remoteness Area classification. Each postcode is mapped to the Remoteness Area category within which the majority of the postcode's population reside. PO Box postcodes are mapped to the Remoteness Area category within which the Post Office is located.

Input dataset or table	Description
ASGS table	Table of ASGS' mapped to the Remoteness Area category within which the majority of the ASGS's population resides.
SLA table	Table of Statistical Local Areas (SLAs) mapped to the 2011 ASGS Remoteness Area classifications. Each SLA is mapped to the Remoteness Area category within which the majority of the SLA's population reside.
2019-20 NWAU Price Weight tables	2019-20 NWAU Admitted subacute and non-acute AN-SNAP and Care Type Same Day and Overnight Per Diem Price Weight tables, found in the NEP19 Determination.
2019-20 NWAU Adjustments	2019-20 NWAU admitted subacute and non-acute adjustments, found in the NEP19 Determination.

Fifteen variables are required to form the input APC dataset. These variables form part of the APC NMDS and the ASNHC DSS on the IHPA website and are listed in Table 9 below.

Table 9: APC & ASNHC DSS variables used to calculate 2019-20 admitted subacute NWAU.

Dataset	Variable
APC NMDS	State Identifier
	Hospital Geographical Indicator
	Date of Birth
	Date of Admission
	Date of Separation
	Care Type
	Indigenous Status
	Funding Source
	Total Leave Days
	Postcode of Patient's Usual Residence
	Australian Statistical Geography Standard of Patient's Usual Residence
	Statistical Local Area of Patient's Usual Residence
ASNHC DSS	AN-SNAP Class (Version 4)
	Palliative Phase of Care Start Date
	Palliative Phase of Care End Date

5. Emergency care cost model

5.1. General issues

5.1.1. Cost unit

The cost unit for ABF for emergency care is an 'emergency department stay'[14] or presentation. It includes stays for patients who are treated and go home, and ones that are subsequently admitted to hospital or transferred to another facility for further care.

5.1.2. Scope

Emergency care is that provided to patients registered for care in an emergency department within a selected public hospital. Patients declared dead on arrival are considered in scope if the death is certified by an emergency department clinician. Patients who leave the emergency department after being triaged and advised of alternative treatment options, are also considered in scope. All patients in the ABF Emergency Services Care DSS (ABF ESC DSS) are in scope.

Patients being treated in emergency departments may subsequently become 'admitted'. All patients remain in scope for ABF for emergency care until they are recorded as having physically departed the emergency department, regardless of whether they have been admitted.

5.1.3. Classification

Two systems are used to classify emergency care for the purposes of ABF of these services from 1 July 2014: Urgency Related Groups (URGs) Version 1.4 and Urgency Disposition Groups (UDGs) Version 1.3. The former applies to level 3B to 6 emergency departments, and the latter to all others (i.e. levels 1 to 3A). The levels are defined in the NEP Determination (Glossary).

5.2. Analysis of costs to derive NWAU for emergency care

5.2.1. Data preparation

NHCDC Round 21 reported 7,323,739 presentations in 197 ABF establishments with patient-level cost data. This represents 96 percent of the total emergency care population as reported in the ABF DSS datasets and NHCDC.

IHPA undertook an initial data preparation processes in line with that employed for NEP18. The cleansed data is episode level data grouped by URG or UDG. The following data was not used in deriving relativities across URGs and UDGs, but was used to calibrate the overall cost level of the model. This was done in a similar way to the integration of aggregate-level cost data in the admitted acute model:

a. Aggregate data provided at the establishment level in NHCDC Round 21 such as for cost modelled sites;
b. Presentations that grouped to error URGs and UDGs due to missing or invalid data fields;

[14] See *Emergency department stay – presentation date, DDMMYYYY* [METeOR identifier: 471886].

c. Presentations that were less than $5; and
d. Extreme cost outliers within each UDG class.

5.2.2. Sample weights

The NHCDC provides a sample of emergency care activity in public hospitals. To ensure the resulting calculations for the NWAU are appropriate for the full population of emergency care activity, observations from the NHCDC are weighted up to reflect the entire population of emergency care activity by state/territory.

5.2.3. Cost parameters and adjustments

Data enters the cost model at one of three levels: by URG, by UDG, or aggregated to an establishment level. URG data was used to derive an initial set of URG cost parameters. The URG and UDG data was combined to obtain cost parameters across UDGs, and the URG parameters were then calibrated against the UDG parameters. Finally, the URG and UDG datasets were combined with the aggregate data (controlled for UDG casemix) to obtain an overall cost level across the entire sample. The URG and UDG cost parameters are calibrated against this cost level.

This process ensures that the URG and UDG cost parameters are aligned and the overall model costs are equal to actual costs. The approach to pricing emergency care services incorporates an adjustment for patient age, indigenous status and patient remoteness. In addition, for the NEP19, an additional adjustment was introduced to account for additional costs associated to establishments in remote locations. The *Indigenous Adjustment* is inherited from the Admitted Acute Care Cost model. The *Patient Residential Area Remoteness Adjustment* is a single adjustment derived and applied to patients assigned to remote and very remote locations, and the *Patient Treatment Remoteness Area Adjustment* is calculated and applied in a similar manner. A discrete age adjustment is calculated and applied to emergency service patients aged 65 to 79 years inclusive and over 79 years.

The current National Pricing Model Stability Policy requires that the year to year movements in price weights are capped at 20%. For NEP19, there are no price weights that meet this threshold. Subsequently, no price weights are stabilised for NEP19.

5.2.4. Price weights and NWAU

The final step of the process involves the conversion of cost parameters to cost weights. This is done by dividing the URG and UDG cost parameters by the reference cost for the admitted acute cost model. These cost weights are then converted to the price weights used to calculate the NWAU.

As set out in the NEP19 Determination, the price of an ED ABF activity is calculated using the following formula with adjustments as applicable:

Price of an emergency department or emergency service ABF Activity

$$= \{\mathrm{PW} \times (1 + \mathrm{A_{Ind}} + \mathrm{A_{Res}}) \times (1 + \mathrm{A_{Treat}}) \times (1 + \mathrm{A_{ECA}})\} \times \mathrm{NEP}$$

Where:

$\mathbf{A_{Ind}}$	means the *Indigenous Adjustment*
$\mathbf{A_{ECA}}$	means the *Emergency Care Age Adjustment*
$\mathbf{A_{Res}}$	means the *Patient Residential Remoteness Area Adjustment*

A_{Treat}	means the *Patient Treatment Remoteness Area Adjustment*
NEP	National Efficient Price 2019-20
PW	means the Price Weight for an ABF Activity as set out in Appendix L (for emergency department) or Appendix M (for emergency service) of the NEP19 Determination.

The table below outlines the required information in order to apply the above formula.

Table 10: Dataset and tables required for assignment of NWAU to emergency department patient data.

Input dataset or table	Description
NAPEDC NMDS	Dataset based on the 2019-20 Non-Admitted Patient Emergency Department Care National Minimum Data Set (NAP EDC NMDS) located on the IHPA website.
2019-20 NWAU Price Weight tables	2019-20 Emergency Department NWAU URG and UDG Price Weight tables, found in the NEP19 Determination.
2019-20 NWAU Adjustments	2019-20 Emergency Department NWAU Adjustments, found in the NEP19 Determination.

The following variables are required to form the input ED dataset:

- Establishment Identifier;
- Hospital geographical Indicator;
- Postcode of Patient's Usual Residence;
- Australian Statistical Geography Standard of Patient’s Usual Residence;
- Indigenous status;
- Date of admission;
- Date of birth;
- Episode end status;
- Type of visit to Emergency Department;
- Triage category; and
- URG (version 1.4) or UDG (version 1.3).

These variables form part of the NAPEDC NMDS on the IHPA website.

6. Non-admitted care cost model

6.1. Overview

6.1.1. Cost unit

The cost unit for non-admitted care is a Non-Admitted Patient Service Event. This is "*an interaction between one or more healthcare provider(s) with one non-admitted patient, which must contain therapeutic/clinical content and result in a dated entry in the patient's medical record.*" [15]

6.1.2. Scope

The scope of non-admitted care includes service events occurring in outpatient clinics in ABF hospitals and in the community, as explained in the Pricing Framework.

6.1.3. Classification

The Tier 2 non-admitted services v5.0 is used to classify non-admitted care for the purposes of ABF as explained in the Pricing Framework and set out in the NEP19 Determination.

6.2. Analysis of costs to derive NWAU for non-admitted (outpatient) care

This section provides an overview of the steps involved in developing the NWAU for non-admitted care. The steps are included below.

6.2.1. Adoption of the NHCDC

Historically, the Non-admitted cost model had relied heavily on the 2012 Ernst & Young Non-admitted and Subacute Care Costing Study (the EY Costing Study) due to the limited quality and stability of NHCDC reporting. With the improvement in reporting and quality of the NHCDC, the cost weights from NEP17 onwards have shifted to adopt the NHCDC.

The table below illustrates the shift in hierarchy for non-admitted cost weight selection.

Table 11: Non admitted Cost weight selection hierarchy.

Cost Weight Selection Hierarchy			
	NEP16	**NEP17**	**NEP18 & NEP19**
Stage 1	Logical Links to acute clinics or other clinics	Logical Links to acute clinics	Logical Links to acute clinics
Stage 2	Adopt EY Costing Study or other Costing studies	Adopt NHCDC (Provided adequate sample and stable across 2 years)	Adopt NHCDC (Provided adequate sample and stable across 3 years)
Stage 3	Adopt NHCDC	Adopt EY Costing Study or other Costing studies	Adopt EY Costing Study or other Costing studies

[15] See object class *Non-admitted patient service event* [METeOR identifier: 400604].

Table 12 provides a breakdown for each clinic by the source data.

Table 12: Non-Admitted Data Source Breakdown.

Source	No of clinics NEP18	No. of Clinics NEP19
Victorian radiotherapy costs	1	1
EY Costing Study	35	26
2014 Costing Study	4	4
NHCDC Round 21	82	91
Admitted acute	2	2
Manual Treatment	1	1
Total	**125**	**125**

The non-admitted model imposes a three year time period for the evaluation of stability. The determination of stability in the NHCDC now necessitates the difference in average clinic price between the current data period and previous data collection to be within the 20 percent threshold, as well as the difference in average price between the last data period and two years ago.

In NEP19, 9 clinics transitioned from being priced using the EY Costing Study to being priced using the NHCDC.

Additionally, the National Pricing Model Stability Policy requires that the year-to-year movement in price weights be restricted to a maximum of 20 percent. In NEP19, 11 clinics were stabilised in adherence to the policy. Table 13 provides the stabilised clinics broken down to a series level.

Table 13: Non-Admitted Stabilised Clinics by Series.

Series	Number of Stabilised Clinics
10: Procedure	1
20: Medical	7
40: Allied	10

6.2.2. Data preparation

Non-admitted patient cost data was received for eight jurisdictions. NHCDC Round 21 (2016-17) included non-admitted data for 224 ABF establishments and 140 Tier 2 Clinics, compared to 213 ABF establishments and 141 Tier 2 Clinics in NHCDC Round 20 (2015-16).

In NEP19, the cost weights for some clinics were determined using the 2012 Ernst & Young Non-admitted and Subacute Care Costing Study (the EY Costing Study). The direct costs collected were inflated to 2016-17 In-scope costs using a combination of a historical inflation factor of 1.25 to account for overheads, and the current NEP indexation rate.

Establishment/clinic combinations were excluded based on:

- Jurisdictional advice;
- Cost ratios being significantly different from the population.

Clinic specific outlier exclusion rules developed for NEP17 and NEP18 were again included in the NEP19 model. Whole establishments were then excluded if their cost ratios across clinics remained consistently high. At the service event level, conservative record level trimming within clinics followed to exclude records with:

- Costs less than $5.
- Events with high cost thresholds after ranking of events by cost.
- Cost ratios being significantly different from the population

For clinic 40.43 (Hepatobiliary) a targeted approach was used for removal of costs associated with Commonwealth pharmaceutical programs. The cost of new medicines introduced in March 2016 - used in the hepatobiliary clinic - were found to not be accurately excluded in IHPA's pharmaceutical claim linking process. Consequently, the direct pharmacy cost bucket values for episodes separated after March 2016 were adjusted to align with the pre-March average cost of $118.

6.2.3. Sample weights

See Section 6.2.1.

6.2.4. Adjustments

Two additional adjustments were introduced for NEP19: the *Patient Residential Remoteness Adjustment* and the *Patient Treatment Remoteness Adjustment.* In addition, the *Non-admitted Multi-disciplinary Clinic Adjustment* (NMDC) was calculated empirically for the first time using the *multiple-provider indicator* recently added to the National Minimum Dataset Specifications.

The raw NMDC value was calculated from a generalised linear model and averaged across three years of empirical values, in accordance with IHPA's national pricing model stability policy, to produce the final NMDC adjustment.

The Indigenous, Patient Regional and Treatment Remoteness values are adopted from the corresponding adjustments in the admitted acute model.

The application of the adjustment parameters mirror the methodology of the acute model as follows:

a. The stabilised MDC adjustment is applied to all MDC records and then the clinic means calibrated;
b. The Indigenous adjustment and Patient Remoteness adjustment are applied concurrently to all Indigenous and/or regional patient records; clinic means are then calibrated;
c. The Treatment Remoteness adjustment is applied to relevant records, and then calibrated.

6.2.5. Price weights and NWAU

Price of a non-admitted ABF Activity

$$= \{\mathrm{PW} \times (1 + \mathrm{A_{NMDC}}) \times\ (1 + \mathrm{A_{Ind}} + \mathrm{A_{Res}}) \times (1 + \mathrm{A_{Treat}})\} \times \mathrm{NEP}$$

Where:

$\mathbf{A_{NMDC}}$	means the *Multi-disciplinary Clinic Adjustment*
$\mathbf{A_{Ind}}$	means the *Indigenous Adjustment*
$\mathbf{A_{Res}}$	means the *Patient Residential Remoteness Area Adjustment*
$\mathbf{A_{Treat}}$	means the *Patient Treatment Remoteness Area Adjustment*

NEP National Efficient Price 2019-20

PW means the Price Weight for an ABF Activity as set out in Appendix K of the accompanying NEP19 Determination

The table below outlines the required information in order to apply the above formula.

Table 14: Dataset and tables required for assignment of NWAU to non-admitted patient data.

Input dataset or table	Description
Non-admitted patient ABF DSS Dataset	Dataset based on the 2019-20 Non-admitted patient ABF Data Set Specifications located on the IHPA website.
2019-20 NWAU Price Weight table	2019-20 Non-Admitted NWAU Price Weight table, found in the NEP19 Determination.
2019-20 NWAU Adjustments	2019-20 Non-Admitted NWAU Adjustments, found in the NEP19 Determination.

Eight variables are required to form the input non-admitted dataset:

- Establishment identifier;
- Indigenous status;
- Multiple health care provider indicator (see NEP19 Determination);
- Outpatient clinic type Tier 2 (Version 5.0);
- Postcode of Patient's Usual Residence;
- Australian Statistical Geography Standard of Patient’s Usual Residence;;
- Hospital geographical Indicator; and the
- Funding source.

These variables form part of the Non-Admitted Patient ABF Data Set Specifications on the IHPA website.

7. Conversion to a pricing model

7.1. Overview

The 2019-20 National Pricing Model is the seventh annual pricing model that IHPA has produced. Each pricing model comprises a National Efficient Price (NEP), Price Weights and adjustments, and each is based on cost and activity data from three years prior; the 2019-20 pricing model is based on 2016-17 cost and activity data.

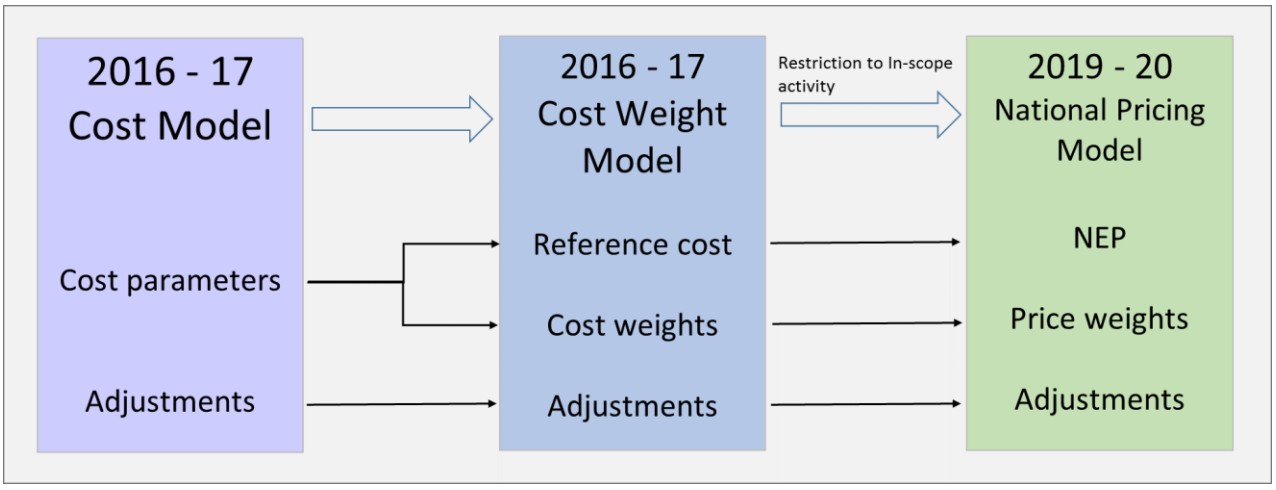
The cost and activity data for each of the historical years are used to derive a cost model for that year, with only those costs and activity from Activity Based Funding (ABF) establishments being used. The cost model is designed to ensure that the total modelled costs are equalised with the estimated total actual costs across the ABF establishments.

The cost model is made up of cost parameters and adjustments, including the paediatric adjustment, specialist mental health age adjustment, Indigenous adjustment, remoteness area adjustment and ICU adjustment, but it excludes the private patient service adjustment and private patient accommodation adjustment. The latter two adjustments are introduced in the pricing model to remove out of scope patient costs associated with private patients (see Section 2).

There are four steps in the transformation of each year's cost model into its associated pricing model, namely:

a. Identification and exclusion of costs and activity regarded under the National Health Reform Agreement as out of scope for the purpose of ABF.
b. Derivation of a reference cost (or standardised mean) used to transform the cost model into a cost weight model.
c. Derivation of an annual indexation rate used to inflate the cost model to a level reflective of the estimated cost of delivering hospital services in the year of the pricing model.
d. Transformation of the cost model to the pricing model using the results of the previous three steps.

Figure 5: Process of transforming the 2016-17 Cost Model to the 2019-20 National Pricing Model.



7.2. Identification of out of scope costs

The first step in the process of transforming cost model to pricing model involves the identification of out of scope costs, such as those associated with programs covered entirely or in part by other Commonwealth funding. These out of scope costs can be separated into three groups:

- Group 1: Costs associated with out of scope activity, including activity delivered to out of scope patient types such as the Department of Veteran's Affairs (DVA), Defence and compensable patients, and activity not regarded as from an in-scope service type, such as that delivered through out of scope non-admitted Tier 2 Clinics.
- Group 2: Those proportions of costs associated with private patients that are offset by non-government and Commonwealth revenue.
- Group 3: Costs associated with other Commonwealth programs that are inherent within the cost data such as the Highly Specialised Drugs program and Pharmacy Reform Agreements.

Exclusion of these costs from the cost model is undertaken as follows:

a. Group 1 costs are excluded by simply restricting the cost model to in-scope activity.
b. Group 2 costs are excluded through the implementation of the private patient service adjustment and private patient accommodation adjustment within the pricing model.
c. Group 3 costs are excluded by matching at the patient level where possible, otherwise by first calculating the costs as a percentage of estimated total costs, and then deflating the cost model by this percentage.

7.3. Derivation of a reference cost

The second step in the transformation of cost model to pricing model is the derivation of a reference cost (or a mean standardised to ensure the measure of an NWAU remains constant over time) that is used to convert the cost model into a cost weight model. Put simply, the parameters of the cost model are divided by this reference cost, converting the parameters to cost weights.

A separate reference cost is derived for each year's cost model based on the modelled costs of admitted acute activity in-scope for ABF. In particular, this activity excludes the Group 1 out of scope costs discussed in Section 2.

The 2009-10 reference cost associated with IHPA's first National Pricing Model is defined as the mean model cost taken across all 2009-10 admitted acute activity in-scope for ABF. This mean model cost is $4,260.

From 2010-11 onward, the reference cost is defined so that change in the reference cost over time reflects change in unit costs, excluding any influence of underlying changes in activity profiles between years (i.e. case-mix change). So, the 2010-11 reference cost is defined so that the change from the 2009-10 reference cost represents change in unit costs of an NWAU between the 2009-10 and 2010-11 cost models, excluding the effect of any changes in case-mix between 2009-10 and 2010-11. Similarly, the 2016-17 reference cost represents the change in unit cost between the 2015-16 and 2016-17 cost models, excluding the effect of any changes in case-mix between 2015-16 and 2016-17.

To exclude the external effects of case-mix change between years, the two cost models are compared by first applying them to a common set of activity, namely 2016-17 admitted acute activity in-scope for ABF. Once applied to this activity, the resulting pair of mean model costs is calculated, and the change between the two cost models is defined as the change in these two mean values. This is referred to as the standardised change in cost models, with the associated growth referred to as the standardised growth rate. In other words, the growth between the 2015-16 and 2016-17 cost models is standardised against 2016-17 activity.

Note that there was a substantial shift in diagnosis coding in the 2016-17 activity, which leads to a lower than trend standardised growth rate between the 2015-16 and 2016-17 cost models. As part of the 2016-17 funding reconciliation process, the Administrator of the National Health Funding Pool applied back-casting multipliers to the 2015-16 activity data in order to reflect the diagnosis coding behaviour in 2016-17 so that the change in activity between the two years could be measured on a like-with-like basis.

The Administrator's decision has been reflected when calculating the 2016-17 reference cost for NEP19 by incorporating the same adjustment to the 2015-16 data for the purposes of comparing the 2015-16 cost model and the 2016-17 cost model below.

Table 15 shows the mean model costs of each model based on their application to the 2016-17 ABF activity along with the resulting standardised growth rate.

Table 15: Mean model costs when each cost model is applied to 2016-17 in-scope admitted acute activity data, and resulting standardised growth rate.

2015-16 cost model	2016-17 cost model	Standardised growth rate
$4,702	$4,787	1.81%

Finally, the 2016-17 reference cost is defined as the 2015-16 reference cost indexed by the standardised growth rate; that is, the 2016-17 reference cost:

= (2015-16 reference cost) × (standardised growth rate)

= $4,779 × 101.81%

= $4,866

Both 2015-16 and 2016-17 reference costs are given in Table 16.

Table 16: Reference costs for 2015-16 and 2016-17 cost models.

2015-16 cost model	2016-17 cost model
$4,779	$4,866

The conversion of the 2016-17 unadjusted mean model cost given in Table 15 to the 2016-17 reference cost given in Table 16 (i.e. $4,779 → $4,866) is often referred to as 'rebasing'.

Figure 6 illustrates this rebasing process in the context of the derivation of the 2016-17 reference cost.

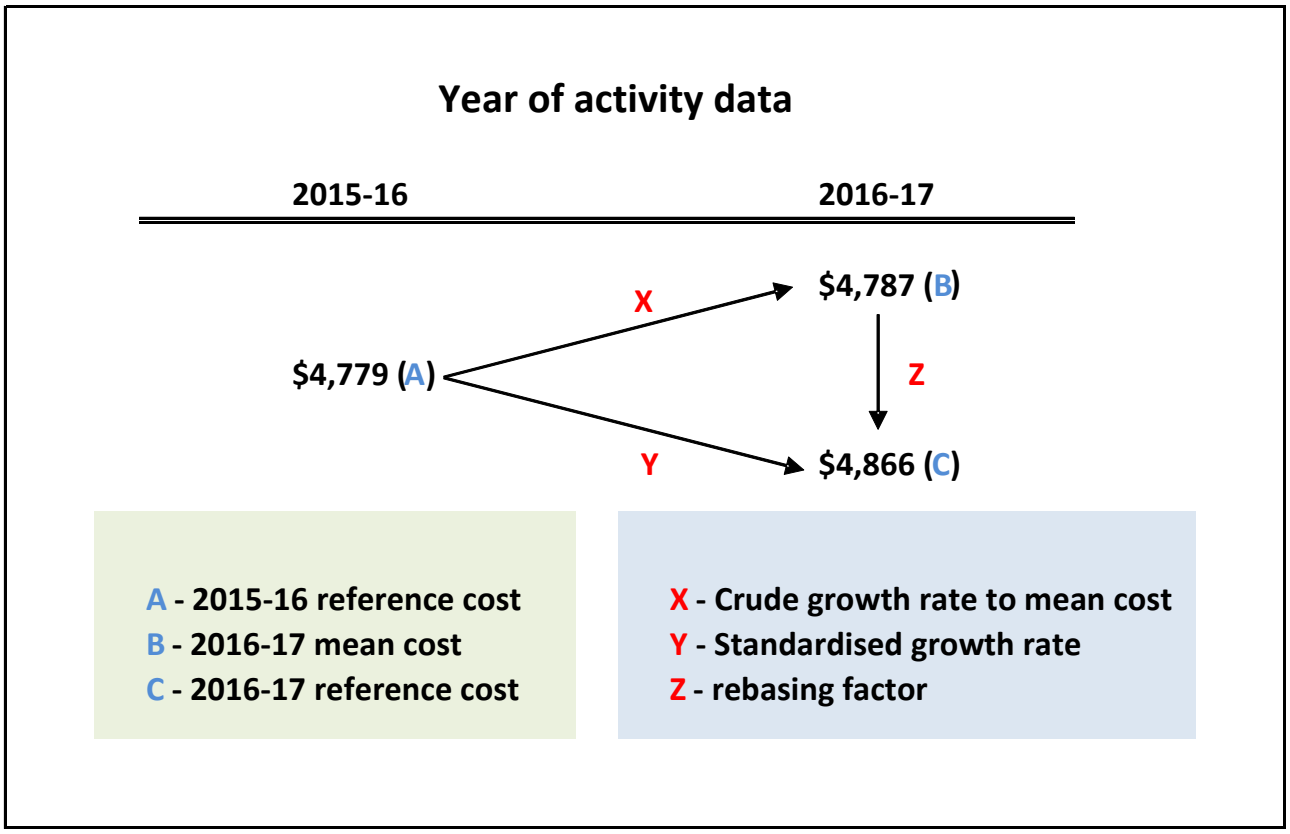


Figure 6: Derivation of 2016-17 reference cost.

There are two intended consequences of the selection of the reference costs:

1. The change in reference costs represents change in unit costs excluding the effect of any changes in case-mix; and
2. The 2015-16 and 2016-17 cost weight models give the same total weighted volume when applied to the 2016-17 activity data on which the standardised growth rate is derived.

7.4. Indexation

The final step in the transformation of the cost model to pricing model is the indexation of costs to estimate those in the year of the pricing model. Describing the methodology in the context of the 2019-20 pricing model, the objective is to derive an annual indexation rate that is used to inflate the 2016-17 cost model over three years to a level reflective of estimated 2019-20 costs.

To derive this rate, the 2016-17 cost model is applied retrospectively to the five years of patient costed admitted acute activity data[16] prior to 2016-17, and comparisons are made between actual and modelled costs to determine the scaling of the 2016-17 cost model required to equalise each year's modelled costs and actual costs. The trend of these scaling factors from 2010-11 to 2016-17 is then projected to model the indexation rate for the following three years.

Figure 7 illustrates the 2016-17 cost model applied to patient costed admitted acute activity data and shows the scaling factors required to ensure the model costs are equalised with actual costs. Since the 2016-17 cost model itself is equalised against 2016-17 actual costs, the scaling factor

[16] That is, activity from patient costed sites within the National Hospital Cost Data Collection (NHCDC).

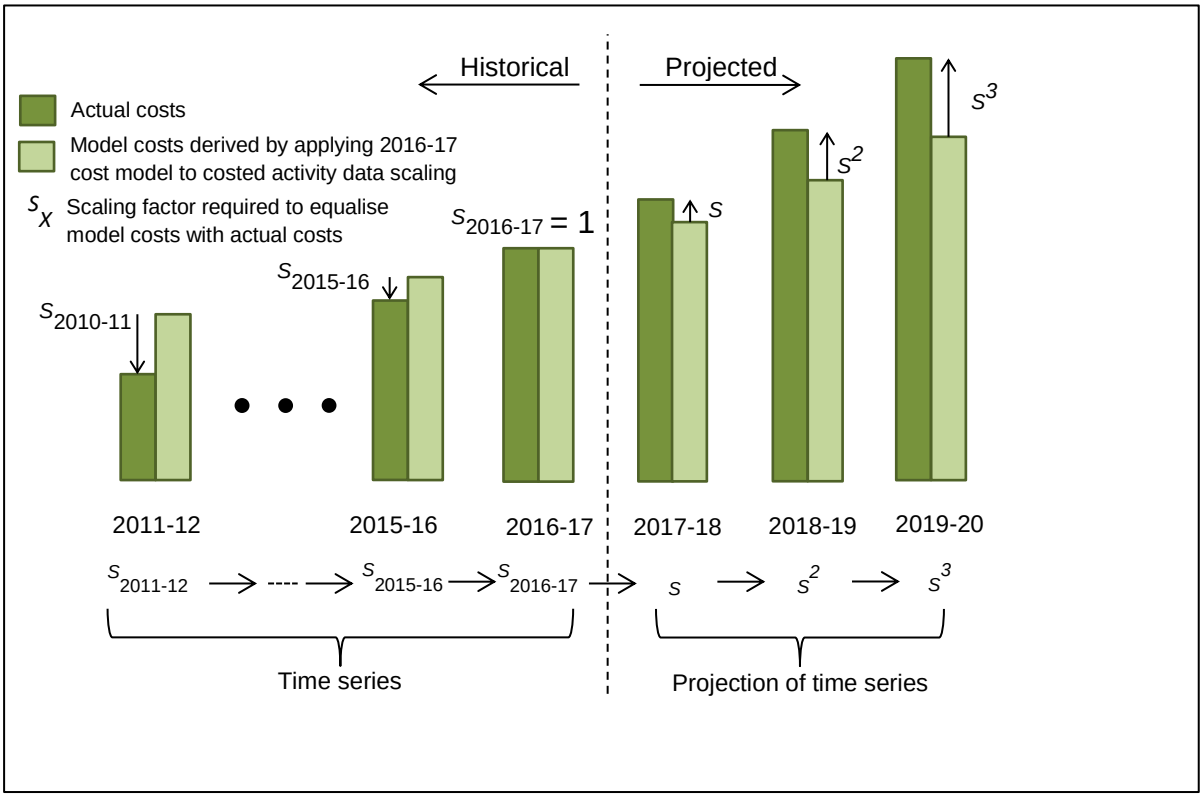
for 2016-17 is equal to 1 (i.e. no scaling required). Going back through the prior five years of cost data, scaling factors of less than 1 are required to deflate the modelled costs down to the level of the actual costs. This time series of scaling factors,

$$S_{2011-12} \rightarrow \cdots \rightarrow S_{2016-17},$$

is then used to model an annual scaling factor, denoted ***s***, which would inflate the 2016-17 cost model up to 2019-20 projected actual costs. The indexation rate is then based on this annual scaling factor.

Figure 7 also illustrates the projected annual scaling factor, *s,* together with projected actual and model costs. The 2019-20 projected scaling factor of s^3 is pictured alongside projected actual and model costs to illustrate that the 2016-17 cost model would require scaling by s^3 to ensure that the resulting 's^3-scaled 2016-17 cost model', when applied to 2019-20 patient costed activity, would estimate the actual costs of the activity.

Figure 7: Illustration of scaling factors required to equalise model and actual costs.



Denoting the historical total actual costs of the activity by:

$$C_{2011-12}, \ldots, C_{2016-17},$$

and denoting the total model costs associated with the 2016-17 cost model applied to each year's costed activity by:

$$M_{2011-12}, \ldots, M_{2016-17},$$

each year's scaling factor s_x is given by:

$$S_x = C_x / M_x$$

This ratio is referred to as the ***cost ratio***.

It is worth noting that multiplying each year's cost ratio by the 2016-17 reference cost of $4,866 converts the $\{s_x\}$ time series to the time series of costs per weighted separation, where the weighted separations are determined by 2016-17 cost weight model.

A crucial requirement of the cost ratio time series is comparability over time. One way to ensure this occurs is to restrict the data on which the ratios are calculated to the set of establishments for which data is present across all five years; that is, to ensure that all five ratios are calculated across a common set of establishments. While this approach ensures comparability over time, it places significant restrictions on the sample of data.

Instead, an alternate method is used that greatly increases the data sample while maintaining comparability of the ratios over time. This method relies on the fact that any time series of ratios can be equivalently represented as the time series of year to year changes in ratios together with a single value of the time series (in this case, the 2015-16 to 2016-17 change in cost ratio of 2.8 percent). This method only requires that each year-to-year comparison uses a common set of establishments (rather than requiring the establishments to be common across all five years).

The Administrator's decision discussed in Section 7.3 was accounted for in the calculation of indexation by using the modified 2015-16 activity data for the purposes of the 2015-16 to 2016-17 change in cost ratio. Note that the 2014-15 to 2015-16 change in cost ratio uses the original, unmodified 2015-16 data.

Table 17 shows the year-to-year changes in cost ratio calculated by applying the 2016-17 cost model to pairs of consecutive years' cost data, ensuring a common set of establishments are present in each pairwise comparison.

Table 17: Year-to-year changes in cost ratio.

2011-12 to 2012-13	2012-13 to 2013-14	2013-14 to 2014-15	2014-15 to 2015-16	2015-16 to 2016-17
1.7%	-0.1%	2.1%	1.7%	2.8%

Table 18 shows the resulting cost ratio time series derived by back-casting the 2016-17 cost ratio of 1.000 using the inverse of the year to year changes given in Table 17. Table 18 also shows the equivalent cost per weighted separation time series, and Figure 8 illustrates the two time series graphically.

Table 18: Cost ratios and costs per weighted separation time series derived by applying the 2016-17 cost model and cost weight model to historical patient costed activity data.

	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Cost ratio	0.9220	0.9375	0.9365	0.9563	0.9728	1.0000
Cost per weighted separation	$4,487	$4,562	$4,557	$4,653	$4,734	$4,866

The next step in the process of deriving an annual indexation rate is to model a line of best fit against the time series of cost ratios (or equivalently, against the time series of costs per weighted

separation). This line of best fit is used to estimate the projected annual inflation factor, *s,* shown in Figure 7.

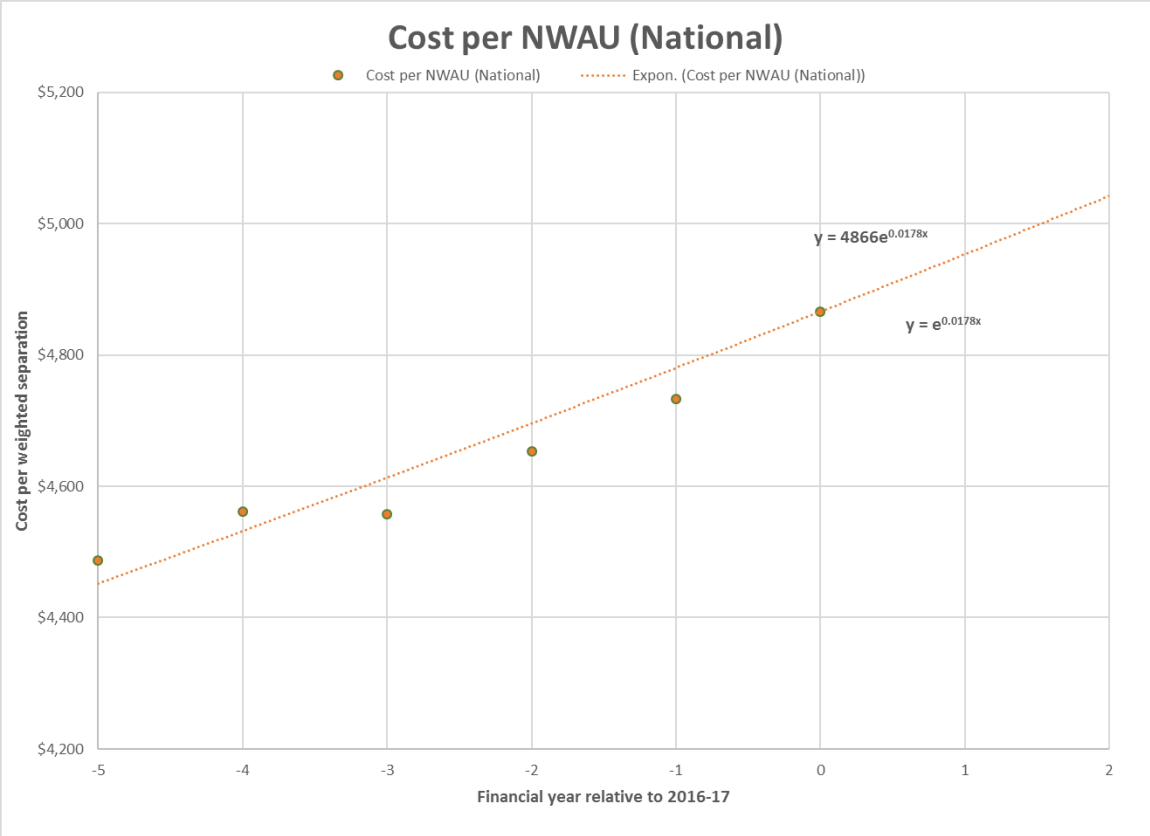
Given that the inflation factor, *s,* being modelled is an annual growth rate (i.e. $s \approx s_{x+1} / s_x$) as opposed to an arithmetic change each year (i.e. $s_{x+1} - s_x$), the line of best fit is taken to have an exponential form. In other words, an exponential form is chosen because exponential functions Ae^{Bx} have the characteristic that their annual growth rate is constant:

$$Ae^{B(x+1)} / Ae^{Bx} = e^{B} = constant.$$

The exponential line of best fit is also modelled so that it passes through the 2016-17 observation to ensure that the resulting annual scaling factor applies to the 2016-17 cost ratio of 1 (or equivalently, to the 2016-17 reference cost of $4,866).

The time series and associated exponential line of best fit are shown in Figure 8. The two equations displayed in Figure 8 represent the exponential line expressed in terms of the cost ratio time series and the cost per weighted separation time series.

Figure 8: Time series of cost ratio and cost per weighted separation with exponential line of best fit.



Note that although the two equations in Figure 8 have different coefficients multiplying the exponential function (i.e. 1 and $4,866), both have precisely the same coefficient inside the exponential function (i.e. 0.0178). The two different coefficients multiplying the exponential function represent the estimated cost ratio and cost per weighted separation in 'year zero' (i.e. x = 0), which is 2016-17. That is, the regression modelled cost ratio for 2016-17 is 1.000 and the modelled cost per weighted separation for 2016-17 is $4,866.

The regression modelled estimates of cost ratio and cost per weighted separation for each of the years from 2011-12 to 2016-17 are given by substituting x = -5…0 into the equations. For example, substituting x = 0 into the equations results in the 2016-17 cost ratio and cost per weighted separation:

$$\begin{aligned} 2016-17 \text{ Cost Ratio} &= 1.000 \times \mathrm{e}^{(0.0178 \times 0)} \\ &= 1.000e^{0} \\ &= 1.000 \end{aligned}$$

And,

$$\begin{aligned} 2016-17 \text{ Cost per weighted separation} &= \$4{,}866 \times \mathrm{e}^{(0.0178 \times 0)} \\ &= \$4{,}866e^{0} \\ &= \$4{,}866 \end{aligned}$$

Finally, the annual scaling factor (i.e. *s* in Figure 7) is then defined as the annual rate of change associated with the exponential line of best fit, and the indexation rate is the growth rate of this annual scaling factor. The annual rate of change of the exponential line is $s = \mathrm{e}^{0.0178}$, which is equal to 1.018, or 101.8 percent. Therefore the indexation rate is 1.8 percent.

7.5. Transformation of cost model to pricing model

The final step in the process of developing the pricing models uses the three steps detailed in the previous sections to transform each cost model to the corresponding pricing model.

Each year's pricing model is designed to reflect estimated total in-scope costs associated ABF activity in the year of the pricing model. The pricing model is therefore given by the inflated cost model defined in Section 7.4 of this attachment with those out of scope costs defined in Section 2 removed. However, the pricing model is represented by the NEP together with price weights and adjustments. This splitting of prices into an NEP component and a price weight component is where the reference cost defined in Section 7.3 plays its role.

To describe the process in the context of the 2019-20 National Pricing Model first the 2016-17 cost model is transformed into a cost weight model by dividing it through by the 2016-17 reference cost of $4,866 (see Section 7.3). The 2016-17 cost model is then represented by a reference cost, cost weights and adjustments.

The inflation of the 2016-17 cost model to estimated 2019-20 costs is then undertaken by inflating the 2016-17 reference cost by the annual indexation rate defined in Section 7.4 and keeping the cost weights and adjustments fixed. The indexed 2016-17 reference cost is $5,134.

The indexed 2016-17 reference cost together with the 2016-17 cost weights and adjustments then represent the estimated 2019-20 cost model. Example 1 demonstrates how this process of indexing the reference cost and keeping the cost weights fixed has the same effect as indexing the entire cost model.

Example 1: Two equivalent methods to derive estimated 2019-20 costs for same day episode in - DRG E42B - Bronchoscopy, Intermediate Complexity.

The 2016-17 same day cost parameter associated with E42B is $2,605.91. Applying the annual indexation rate of 1.8% to the 2016-17 cost, the estimated same day cost of E42B in 2019-20 is given by:

$$\begin{aligned}\text{2019-20 estimated same day cost of E42B} &= (\text{2016-17 estimated cost}) \times (\text{indexation}) \\ &= \$2{,}605.91 \times (101.8\%)^{3} \\ &= \$2{,}749.\end{aligned}$$

On the other hand, the same day cost weight associated with E42B is 0.5355 (= $2,605.91/ $4,866). Applying the annual indexation rate to the 2016-17 reference cost, the resulting estimated cost of a same day episode in E42B in 2019-20 is given by:

$$\begin{aligned}\text{2019-20 estimated same day cost of E42B} &= (\text{2016-17 cost weight}) \times (\text{indexed reference cost}) \\ &= 0.5355 \times (\$4{,}866 \times (101.8\%)^{3}) \\ &= 0.5355 \times \$5{,}134 \\ &= \$2{,}749.\end{aligned}$$

7.6. Backcasting for ABF

Backcasting is the process by which the effect of significant changes to the ABF classification systems or costing methodologies are reflected in the pricing model the year prior to implementation, for the purpose of the calculation of the Commonwealth's funding for each ABF service category.

In accordance with Clauses A34(b) and A40 of the NHRA, the Pricing Authority has applied the methodological changes made in NEP19 to NEP18 to determine the backcast NEP18 for the purposes of determining Commonwealth growth funding between 2018-19 and 2019-20. The backcast amount for NEP18 is provided in Chapter 8 of the NEP19 Determination.

7.6.1. Backcasting ABF volume

IHPA has also estimated the volume impact of methodological changes between NEP18 and NEP19, which can be used for the purpose of estimating movements in volume between NEP18 and NEP19. This is useful for relating NWAU18 activity to NWAU19 targets, and for estimating Commonwealth growth funding prior to actual 2019-20 activity data being available.

The volume multipliers (VM) are calculated for each jurisdiction for each particular ABF service category stream and are provided in Chapter 8 of the NEP19 Determination. The backcast volume multipliers for each jurisdiction (for each ABF product category) are calculated from the most recently reported activity data, namely 2017-18, as:

$$\text{VM} = \frac{\text{NWAUs delivered by backcast model (NWAU19 calculator)}}{\text{NWAUs delivered by original cost model (NWAU18 calculator)}}$$

The volume multipliers can be applied to estimates of an NWAU count for 2019-20 if actual data is not available.

8. Block funded hospitals

8.1. General issues

8.1.1. Cost unit

The cost unit is a hospital.

8.1.2. Scope

Hospitals are in-scope if they have been nominated by a jurisdiction and meet the criteria for block funded hospitals. The criteria that defines a block funded hospital is less than 3,500 total NWAU per annum for rural hospitals and less than 1,800 admitted acute NWAU per annum for city hospitals.

8.1.3. Classification

The cost model for NEC19 comprises of 372 small rural hospitals, six less than the 378 hospitals in NEC18. Of these, 370 were used in the modelling, while another 2 hospitals were manually added but excluded from modelling due to incomplete data. There are 11 major city, 20 specialist psychiatric and 3 other hospitals that are block funded on a separate basis. The NEC19 model remains largely unchanged from NEC18, comprising of the following key features:

- Eight size groups:
    - Group 0: Less than $0.5 million
    - Group A: 0 - 259.9 NWAU
    - Group B: 260 – 459.9 NWAU
    - Group C: 460 – 659.9 NWAU
    - Group D: 660 – 1049.9 NWAU
    - Group E: 1050 – 1699.9 NWAU
    - Group F: 1700 – 2499.9 NWAU
    - Group G: 2500 – 3500.0 NWAU
- Two locality groups:
    - Region 1: Inner regional, outer regional, remote;
    - Region 2: Very remote.
- Three hospital type groups for establishments in Region 1:
    - Type A: Hospitals with more than 30 NWAUs of either surgical or obstetric episodes and which have a size group of at least Group B including expenditure greater than $0.5m;
    - Type B: Hospitals not in Type A that have more than 40 percent of their total NWAU as admitted activity, and which have a size group of at least Group B including expenditure greater than $0.5m;
    - Type C: Other hospitals in Region 1, but not in Types A or B.
- Using regression analysis to determine the cost weights.

8.2. Analysis of costs

8.2.1. Data preparation

The approach underpinning IHPA's data preparation process was updated for NEC17 in line with the 2014-15 National Public Hospital Establishment Dataset (NPHED) update. The methodology has been maintained for NEC19 and involves:

a. Extraction of activity data from the IHPA ABF DSS for each block funded hospital and conversion of that data into in-scope NWAUs;
b. Extraction of in-scope establishment expenditure data from the NPHED.

The establishment data required to populate the 2016-17 cost model table are:

- Latest 3-year average of admitted acute and total in-scope NWAU per annum (2014-15 to 2016-17);
- Total in-scope establishment expenditure in 2016-17;
- Latest 3-year average NWAU assigned to surgical and obstetric delivery DRGs.

The eligibility of hospitals for block funding is determined by ensuring that the latest three-year average of total NWAU is less than 3,500 NWAU per annum for rural hospitals and the admitted acute activity for city hospitals is less than 1,800 NWAU per annum.

The NWAU activity measure is calculated first and then the best estimate of 2016-17 in-scope expenditure is derived, as set out below. A guide to the process used to prepare data for NEC19 is set out in Appendix E.

8.2.1.1 In-scope activity

Admitted acute and subacute NWAU

Patient-level admitted data was available from approximately 96 percent of hospitals in the APC stream.

The patient-level admitted data has been fed through the NEP18 NWAU calculator to calculate the in-scope NWAU and public patient equivalent NWAU of all in-scope hospital activity. A slightly modified version of the calculator is used for episodes with an admission date prior to 1 July 2016 in order to determine the NWAU associated to the portion of the episodes occurring in 2016-17. This is discussed further under the 'Work in progress episodes' section below.

For the few hospitals that do not supply patient level admitted data, admitted NWAU is estimated based on sum of the reported in-scope admitted acute and subacute expenditure from the NPHED. The number of admitted NWAU is calculated by multiplying the total reported admitted expenditure by 0.000145.

The admitted multiplier is the parameter estimate from a linear regression of NWAU (using the NEP18 NWAU calculator) versus total admitted expenditure for small hospitals (total public patient equivalent NWAU less than 5,000) that have admitted activity data. Due to data quality issues, all establishments from Victoria were excluded as reference data for the modelling process.

Work in progress episodes

The block funded cost model is used to calculate the expected in-scope cost of a block funded hospital for a single financial year. The patient-level admitted activity data contains episodes separated in the financial year, in some cases having been admitted up to 15 years prior. Using the NWAU calculator as it stands would assign 15 years of activity to this single patient, resulting in incomparable cost and activity calculations. On the other hand, there may be episodes admitted

during the financial year that have not yet been discharged, and thus do not appear in the activity data. Episodes admitted before the beginning of the financial year or separated after the financial year are referred to as "work in progress" (or WIP) patients.

To address this issue, WIP patients which have been separated during the financial year have their total weighted activity reduced so that only NWAU associated to the current financial year are included. To account for WIP patients not yet discharged, each establishment's total NWAU is scaled up based on state-level ratios calculated over three years of data. The ratios used for NEC19 are shown in Table 19.

Table 19: State-level admitted WIP ratios.

State	WIP Adjustment
NSW	1.7%
Vic	2.7%
Qld	1.9%
SA	2.3%
WA	1.4%
Tas	2.7%

Emergency Department NWAU

Approximately 46 percent of block funded hospitals reported emergency activity at the patient level, and 53 percent report aggregate presentation information at the UDG level. Also, 15 percent of block funded establishments reported basic summary counts and activity estimates. Where available, these data are used to determine NWAU values utilising the NEP18 price weights.

For hospitals that do not supply emergency activity data, emergency NWAU is estimated based on the reported emergency expenditure from the NPHED. The number of emergency NWAU is calculated by multiplying the total reported emergency expenditure by 0.000190.

The emergency multiplier is the parameter estimate from a linear regression of NWAU (using the NEP18 NWAU calculator) versus total emergency expenditure for small hospitals (total public patient equivalent NWAU less than 5,000) that have emergency activity data. Due to data quality issues, all establishments from Victoria were excluded as reference data for the modelling process.

Non-admitted NWAU

Approximately 59 percent of block funded hospitals reported non-admitted activity at the patient level, and 86 percent reported aggregate service event information at the clinic level. Where available, these data are used to determine NWAU values utilising the NEP18 price weights.

For the hospitals that do not supply non-admitted activity, non-admitted NWAU is estimated based on reported in-scope non-admitted expenditure from the NPHED. The number of non-admitted NWAU is calculated by multiplying the total reported in-scope non-admitted expenditure by 0.000083.

The non-admitted multiplier is the parameter estimate from a linear regression of NWAU (using the NEP18 NWAU calculator) versus total in-scope non-admitted expenditure for small hospitals (total public patient equivalent NWAU less than 5,000) that have non-admitted activity data. Due to data

quality issues, two establishments from Victoria were excluded as reference data for the modelling process.

8.2.1.2 In-scope expenditure

- Depreciation is excluded from the NPHED reports of expenditure.
- Multi-purpose Services (MPS) payments have been excluded from the NPHED total expenditure except where jurisdictions have advised that MPS amounts were already excluded in the NPHED reported expenditure.

8.2.2. Calculation of cost parameters

The placement of a hospital in a group is based on the average total NWAU over the three years from 2014-15 to 2016-17; namely, the sum of the NWAU for all admitted acute, subacute, ED and non-admitted in-scope hospital services.

For NEC19, 372 hospitals have been designated as block funded and have been grouped by size, type and locality for the specification of availability and service capacity elements to determine NEC19. The distribution of these 372 hospitals is shown in Table 20.

Table 20: Distribution of block funded hospitals across size-locality cells.

		Volume Group							
Region Group	**Type**	**Group 0**	**Group A**	**Group B**	**Group C**	**Group D**	**Group E**	**Group F**	**Group G**
1	**A**			2	7	17	21	16	11
	B			51	31	34	14	4	2
	C	7	85	10	7	2	3	1	
2		2	11	9	9	6	6	4	

8.3. Calculation of National Efficient Cost

The NEC19 model is largely in line with the model used for NEC15, NEC16, NEC17 and NEC18, employing the same number of categories for size, type, and locality groupings. Outliers are treated the same in NEC19 as they have been since NEC15, as explained in Section 8.3.1.

The NEC19 average model cost for the year is given as a simple average of total expenditure across all model in-scope hospitals. This is reported as the NEC per block funded hospital in the NEC19 Determination.

As for NEC18, the inlier range was limited to those hospitals whose cost ratios sat between the symmetrical boundary points 0.56 and 1.8 inclusive. The thresholds are symmetrical so that a hospital that is twice the cost of the mean gets treated in a similar way to a hospital that has a cost of half the mean.

8.3.1. Calculation of the efficient cost for a particular hospital

The efficient cost of an inlier, in-scope block funded hospital is given by the availability payment for the hospital's size-type cell. This cost is determined by a regression of the form:

$$\ln(inscope\ expenditure) = s + t$$

for each region, where *s* and *t* are parameters associated with each hospital's size and type respectively.

Outliers, specialist psychiatric and major city hospitals are treated separately to the 372 rural hospitals within the model and are addressed further below.

(i) Outliers

- Hospitals with cost ratios that fall outside the prescribed cost ratio boundaries, 0.56 and 1.8, referred to as cost outliers, and are prescribed capped cost ratios.
- Hospitals with a cost ratio *greater* than 1.8 are assigned an efficient cost equal to its actual cost divided by 1.8.

$$CR > 1.8 \qquad efficient\ cost = \frac{actual\ cost}{1.8}$$

- Hospitals with a cost ratio *less* than 0.56 are assigned an efficient cost equal to its actual cost multiplied by 1.8 (or divided by 0.56).

$$CR < 0.56 \qquad efficient\ cost = actual\ cost\ \times 1.8$$

(ii) Hospitals with missing data

Jurisdictional advice was sought on hospitals with missing activity or cost data. Where appropriate, new data received from jurisdictions was incorporated into existing datasets for these hospitals. They are then treated in the same way as hospitals reporting adequate data for the purposes of determining the 2016-17 average cost and NEC19.

8.3.2. Calculation of the efficient cost of specialist psychiatric and major city hospitals

Specialist mental health hospitals are excluded from the model from the outset. These hospitals are assigned model costs based on advice from jurisdictions. Where advice was not received from jurisdictions, the NEC18 efficient cost has been escalated by the NEC19 indexation rate to become the NEC19 efficient cost for each of these hospitals.

For the purposes of NEC19, these hospitals are priced after consultation with jurisdictions. Subject to this advice, their prices are set at their actual cost for 2016-17, and are indexed at the same rate applied to the in-scope hospitals in the 2016-17 cost model for NEC19. Indexation is described in further detail in Section 8.4.

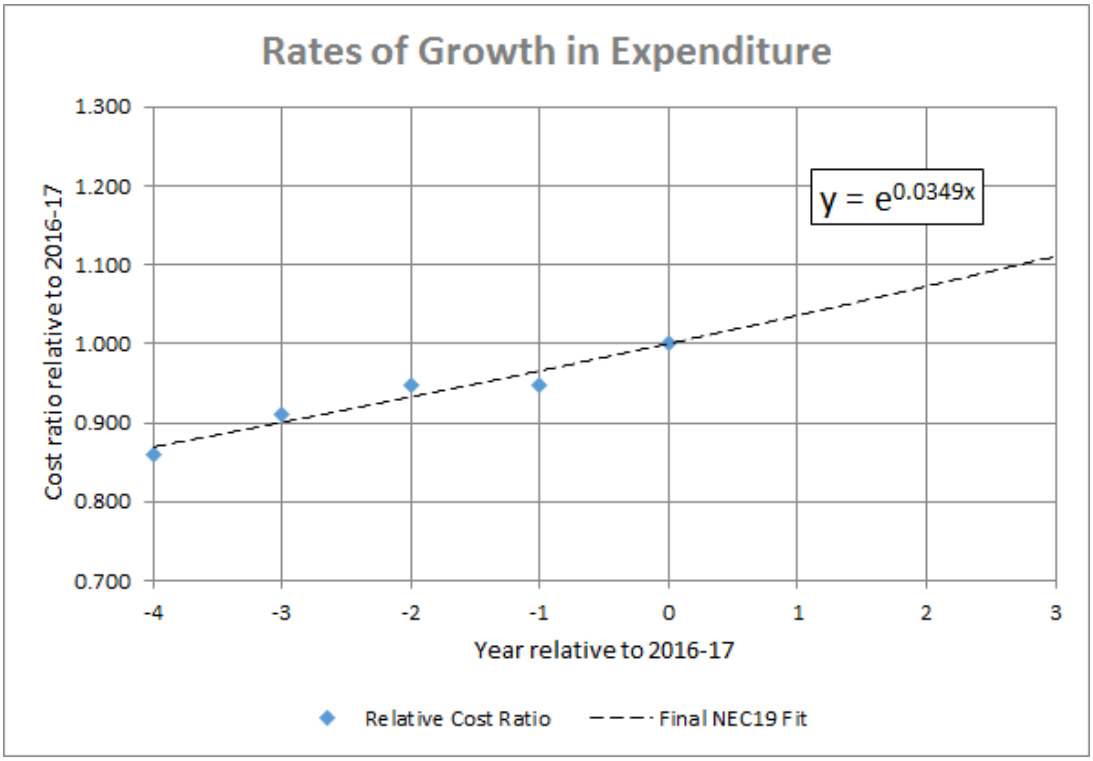
The 2019-20 efficient costs for the 11 major city hospitals, as well as the 3 other standalone hospitals, will be determined separately in a similar way, following consultation with jurisdictions.

8.4. Indexation of the 2016-17 model

Due to the three year time lag in data collection, cost model results for 2016-17 were appropriately indexed over three years to give a price model for 2019-20. The indexation of the model is based on the growth of the NPHED expenditure, net of depreciation and MPS of all block funded hospitals.

Figure 9 illustrates the indexation rate is given by the slope of the exponential line of best-fit. The overall 2016-17 model average-spend was projected to 2019-20 using the annual indexation factor as specified in the NEC19 Determination.

Figure 9: NEC19 Indexation.



8.5. Backcasting for Block Funded hospitals

In accordance with the guiding principles of the NEC cost model, the Pricing Authority has applied the methodological changes made in NEC19 to NEC18 to determine the backcast NEC18 for the purposes of determining Commonwealth growth funding between 2018-19 and 2019-20. The backcast amount for NEC18 is provided in Chapter 6 of the NEC19 Determination.

A late submission of data was received, updating stream level activity in 2014-15 and 2015-16 for a number of establishments within a single jurisdiction. To reflect these changes within the backcast calculation, an Update Component is calculated for each jurisdiction as follows:

$$Update\ Component = \frac{Aggregate\ efficient\ cost\ using\ Updated\ NEC18\ cost\ model}{Aggregate\ efficient\ cost\ using\ Original\ NEC18\ cost\ model}$$

The impact of methodological changes is measured separately by applying the NEC18 and NEC19 versions of the cost model to the latest available data – namely 2016-17. The NWAU component for each state is calculated as follows:

$$NWAU\ Component = \frac{Aggregate\ efficient\ cost\ using\ NEC19\ cost\ model}{Aggregate\ efficient\ cost\ using\ NEC18\ cost\ model}$$

Finally, an overall backcast multiplier (BM) is calculated for each jurisdiction, by combining their respective components as follows:

$$Backcast\ Multiplier\ (BM) = NWAU\ Component * Update\ Component$$

NEC17 introduced a new indexation methodology in projecting the then 2015-16 average in-scope cost to the 2017-18 NEC. This has been retained for NEC18 and again for NEC19, and means that a backcast NEC18 must be calculated in order to estimate the growth between 2018-19 and 2019-20. The backcast NEC18 is calculated by taking the average in-scope cost for NEC19 and indexing it forward two years based on the latest indexation methodology.

The backcast efficient cost for each state is calculated by multiplying the sum of block-funded weights by the backcast multiplier for that state and the backcast NEC18. The implied growth in efficient cost is then determined by dividing the NEC19 efficient cost by the backcast NEC18 efficient cost.

Appendices

Appendix A: Reference tables

Table 21: Sections of the NEP19 and NEC19 Determinations.

Component	Section of Determination
National Efficient Price	Chapter 2
Admitted acute services - NEP19	
AR-DRG inlier bounds, flags for designated same-day payment AR-DRG and unbundled ICU AR-DRG, National Weighted Activity Unit (NWAU) weights for same-day payment AR-DRGs, short-stay outliers (base and per diem), inliers, long-stay outliers (per diem), Intensive Care Unit (ICU) rates per hour	Appendix H
Adjustments to Price Weights	Chapter 5
List of radiotherapy ICD-10-AM codes	Appendix B
List of dialysis ICD-10-AM codes	Appendix C
Specified ICUs	Appendix D
Specialised children's hospitals	Appendix E
Private patient adjustments	Appendix F
Provisional weights for very long stay patients	Appendix G
Funding adjustments for hospital acquired complications	Appendix N
Definition of an eligible ICU or paediatric ICU (PICU)	Glossary
Emergency department services - NEP19	
Urgency Related Groups v1.4 classification and NWAU weights	Appendix L
Urgency Disposition Groups v1.3 classification and NWAU weights	Appendix M
Emergency departments in-scope for ABF	Glossary
Definitions of emergency department role levels	Glossary
Non-admitted services - NEP19	
Tier 2 non-admitted services classification v5.0 weights	Appendix K
Definition of Tier 2 list of non-admitted services classifications v5.0	Glossary
Subacute and non-acute services - NEP19	
AN-SNAP v4 weights	Appendix I
Paediatric per diem price weights	Appendix J
Definitions of AN-SNAP v4	Glossary

Component	Section of Determination
Mental health services - NEP19	
AR-DRG-based inlier bounds, NWAU and adjustment weights	Appendix H
Mental health age adjustments	Chapter 5
Block funded hospital services - NEC19	
NEC weights, Efficient costs for each block funded hospital	Chapter 3

Table 22: Summary of classification systems and sources of cost.

Service stream	Classification[17]	Cost data	Activity data
Admitted acute care	Australian Refined Diagnosis Related Groups (AR-DRG) version 9.0 (v9)	National Hospital Cost Data Collection (NHCDC) Round 21 (2016-17).	Admitted Patient Care National Minimum Data Set (APC NMDS)
Emergency department care	Urgency Related Group (URG) version 1.4 Urgency Disposition Groups (UDG) version 1.3	NHCDC Round 21 (2016-17)	*Level 3B to 6 emergency departments*: Non-admitted Patient Emergency Department Care NMDS (NAPEDC NMDS) *Level 1 to 3A emergency departments*: Emergency Services ABF DSS (ABF ES DSS)
Non-admitted care	Tier 2 Outpatient Clinic Definitions version 5.0	NHCDC Round 21 (2016-17)	Non-Admitted Patient NMDS and aggregate DSS[18]
Subacute care (and non-acute)	AN-SNAP v4 Care type	NHCDC Round 21 (2016-17)	APC NMDS and Admitted Subacute and Non-acute Hospital Care DSS (ASNHC DSS)
Block funded services	IHPA-defined size and Australian Statistical Geography Standards (ASGS) location categorisation on total NWAU for hospital	Expenditure data from the National Public Hospital Establishments Data base (NPHED) (2016-17) NHCDC Round 21 (2016-17)	APC NMDS, NAPEDC NMDS, ABF ES DSS, NPHED and aggregate DSS.

[17] Details of each of the classifications are available from: http://www.ihpa.gov.au/internet/ihpa/publishing.nsf/Content/Classifications
[18] Data Set Specification

Appendix B: Application of NWAU variables

Table 23: Acute admitted patients: variable definitions.

Variable	Name	Description	Definition
A00	_pat_radiotherapy_flag	Radiotherapy eligible separation. Either supplied in the input dataset or derived from the list of supplied procedure codes.	1 if patient had radiotherapy related treatment or planning procedure; else 0.
A01	_pat_dialysis_flag	Dialysis eligible separation. Either supplied in the input dataset or derived from the list of supplied procedure codes.	1 if patient had a dialysis procedure and is not in AR-DRG L61Z or L68Z; else 0.
A02	est_eligible_paed_flag	Paediatric adjustment eligible establishment, derived from ICU paediatric eligibility table	1 if establishment is designated as eligible for paediatric adjustment; else 0.
A03	est_eligible_icu_flag	ICU rate adjustment eligible establishment, derived from ICU and paediatric eligibility table	1 if establishment is designated as eligible for ICU rate adjustment; else 0.
A04	_pat_remoteness	Patient Residential Remoteness Area	2011 ASGS Remoteness Area category of the patient location taken from the episode's geographical information in ranked order of preference: SA2, postcode, SLA value, or the hospital geographical indicator variable where: 0 = Major City; 1 = Inner Regional; 2 = Outer Regional; 3 = Remote; and 4 = Very Remote.
A05	_treat_remoteness	Patient Treatment Remoteness Area	2011 ASGS Remoteness Area category of the patient treatment location taken from the hospitals geographic location information, where: 0 = Major City; 1 = Inner Regional; 2 = Outer Regional; 3 = Remote; and 4 = Very Remote.
A06	_pat_acute_flag	Acute patient flag	1 if (Care Type = 1) or (Care Type = 7 and Number of Qualified Days for Newborns > 0); else 0.
A07	_pat_los	Length of stay	Max(1, (Date of Separation) - (Date of Admission) - (Total Leave Days)) if Care Type = 1; else Total Qualified Days if Care Type = 7.
A08	_pat_sameday_flag	Same-day flag	1 if Date of Admission = Date of Separation; else 0.
A09	_pat_age_years	Age at admission (in years)	Total whole years from Date of Birth to Date of Admission.

Variable	Name	Description	Definition
A10	_pat_eligible_paed_flag	Paediatric Adjustment eligible patient	1 if (_pat_age_years between 0 and 17) and (est_eligible_paed_flag=1); else 0.
A11	_pat_ind_flag	Indigenous patient flag	1 if Patient Indigenous Status = 1, 2 or 3; else 0.
A12	_pat_private_flag	Private patient flag	1 if Funding Source = 9 or 13 for 2013-14 data and later.[19]
A13	_pat_public_flag	Public patient flag	1 if Funding Source = 1, 2 or 8 for 2013-14 data and later.[20]
A14	_pat_spa_category	Patient specialist psychiatric category. All patients classified have positive psychiatric care days.	• 0: if not a specialist psychiatric patient • 1.1: if 0 to 17 years from establishment not eligible for Paediatric Adjustment and in MDC 19 or 20 • 1.2: : 0 to 17 years from establishment eligible for Paediatric Adjustment and in MDC 19 or 20 • 2.1: if 0 to 17 years from establishment not eligible for Paediatric Adjustment and not in MDC 19 or 20 • 2.2: : 0 to 17 years from establishment eligible for Paediatric Adjustment and not in MDC 19 or 20 • 3: : Greater than 17 years not in MDC 19 or 20
A15	drg_samedaylist_flag	Same-day price list flag	1 if Same-Day Price List variable from joined NWAU AR-DRG Price Weight table equals 'Yes'; else 0.
A16	drg_bundled_icu_flag	Bundled ICU flag	1 if Bundled ICU variable from joined NWAU AR-DRG Price Weight table equals 'Yes'; else 0.
A17	drg_inlier_lb	Inlier lower bound	Inlier lower bound from NWAU AR-DRG Price Weight table.
A18	drg_inlier_ub	Inlier upper bound	Inlier upper bound from NWAU AR-DRG Price Weight table.
A19	drg_pw_sd	Same-Day Price Weight	Same-day price weight from joined NWAU AR-DRG Price Weight table if not missing; else 0.
A20	drg_pw_sso_base	Short-Stay Outlier Base Price Weight	Short-stay outlier base price weight from joined NWAU AR-DRG Price Weight table if not missing; else 0.
A21	drg_pw_sso_perdiem	Short-Stay Outlier Per Diem Price Weight	Short-stay outlier per diem price weight from joined NWAU AR-DRG Price Weight table if not missing; else 0.

[19] Or 1 if Funding Source = 2 or 3 for 2011-12 data or earlier.
[20] Or 1 if Funding Source = 1, 10 or 11 for 2011-12 data or earlier.

Variable	Name	Description	Definition
A22	drg_pw_inlier	Inlier Price Weight	Inlier price weight from joined NWAU AR-DRG Price Weight table.
A23	drg_pw_lso_perdiem	Long-Stay Outlier Per Diem Price Weight	Long-stay outlier per diem price weight from joined NWAU AR-DRG Price Weight table if not missing; else 0.
A24	drg_adj_paed	Paediatric adjustment	Paediatric adjustment from joined NWAU AR-DRG Price Weight table.
A25	drg_adj_privpat_serv	Private patient service adjustment	Private patient service adjustment from joined NWAU AR-DRG Price Weight table.
A26	_drg_inscope_flag	DRG in-scope flag	1 if DRG is in scope; else 0.
A27	adj_spa	See definition	Specialist Psychiatric Age adjustment
A28	adj_indigenous	See definition	Indigenous adjustment.
A29	adj_remoteness	See definition	Remoteness adjustment.
A30	adj_treat_remoteness	See definition	Patient treatment remoteness adjustment.
A31	adj_radiotherapy	See definition	Radiotherapy adjustment.
A32	adj_dialysis	See definition	Dialysis adjustment.
A33	state_adj_privpat_accomm_sd	See definition	Private patient accommodation adjustment: same-day rate (state-specific adjustment).
A34	state_adj_privpat_accomm_on	See definition	Private patient accommodation adjustment: overnight per diem rate (state-specific adjustment).
A35	_pat_eligible_icu_hours	Whole eligible hours spent in ICU	Total whole Hours Spent in Intensive Care Unit if hours are greater than or equal to 1; else 0, for unbundled DRGs and eligible establishments
A36	_pat_lost_icu_removed	See Definition	Patient length of stay with ICU hours removed
A37	_pat_separation_category	See definition	Patient separation category: 1: Sameday patients 2: Short Stay outlier patients 3: Inlier patients 4: Long stay outlier patients

Variable	Name	Description	Definition
A38	_w01	DRG by inlier/outlier weight	Based off _pat_separation_category: 1: drg_pw_sd 2: drg_pw_sso_base + drg_pw_sso_perdiem * pat_los_icu_removed 3: drg_pw_inlier 4: drg_pw_inlier + (pat_los_icu_removed - drg_inlier_ub) * drg_pw_lso_perdiem
A39	_w02	Application of the paediatric adjustment	_w01 * (1 + _pat_eligible_paed_flag * (drg_adj_paed - 1))
A40	_w03	Application of the specialist psychiatric age adjustment	_w02 *(1 +adj_spa)
A41	_w04	Application of the Indigenous, remoteness, dialysis and radiotherapy adjustments	_w03x(1+adj_indigenous+adj_remoteness+adj_radiotherapy+adj_dialysis)*adj_treat_remoteness
A42	_adj_icu	Application of the ICU rate adjustment	_pat_eligible_icu_hours * icu_rate.
A43	an90mdc_ra	MDC v9.0	Major Diagnostic Category v9.0
A44-A81	catXXpY	HAC Categories and subcategory flags	e.g. cat01p1 = HAC 1.1 = Stage III Pressure Injury
A82	DRG9_Type	AR-DRG v9.0 Type	Intervention or Medical
A83	agegroupc	Age Group	Age group in 5 year bands (e.g. Age 20-24)
A84	flag_ICUHours	See definition.	1 if episode has ICU Hours; else 0.
A85	flag_AdmTransfer	See definition	1 if episode is has admission mode = ‘transfer’; else 0.
A86	Charlson_score	See definition.	Charlson Score
A87	Flag_emergency	See definition.	1 if episode has emergency admission urgency; else 0.
A88-A100	age_XXg	Age group for HACXX	The age group relevant for risk adjustment of HACXX.
A101-A115	mdc_XXg	MDC group for HACXX	The MDC group relevant for risk adjustment of HACXX.
A116-A130	cc_XXg	Charlson Comorbidity group for HACXX	The Charlson Comorbidity score group relevant for risk adjustment of HACXX.

Variable	Name	Description	Definition
A131-A143	pointsXX	See definition.	Total complexity score for HACXX.
A144-A159	groupXX	See definition	Complexity group relevant to HACXX.
A160-A172	riskadj_XX	See definition.	Funding adjustment relative to HACXX.
A173	HAC_adj	Adopted funding adjustment.	Max(riskadj_01 – riskadj_14)
A174	Error_Code	See definition.	Outlines Errors in calculations
A175	hacflag	See definition.	1 if episode has a HAC; else 0.
A176	hacgroup	See definition.	HAC group adopted for funding adjustment.
A177	complexity	See definition.	Complexity score associated to A176
A178	complexityGroup	See definition.	Complexity group associated to A76 and A177
A179	GWAU18	Gross Weighted Activity Unit	_w04 + _adj_icu
A180	_adj_privpat_serv	Private Patient Service adjustment	_pat_private_flag * drg_adj_privapat_serv*(_w01+_adj_icu)
A181	_adj_privpat_accom	Private Patient Accommodation adjustment	_pat_private_flag*(_pat_sameday_flag*state_adj_private_accom_sd+ (1-_pat_sameday_flag)*_pat_los*state_adj_privpat_accomm_on)
A182	riskAdjustment	NWAU deduction from HAC	A38*A173
A183	NWAU19	National Weighted Activity Unit	Max(0,A179-A180-A181-A182) for only in-scope funding sources

Table 24: Sub-acute admitted patients: variable definitions.

Variable	Name	Description	Definition
S01	_pat_remoteness	Patient Remoteness Area	2011 ASGS Remoteness Area category of the patient location taken from the episode's geographical information in ranked order of preference: SA2, postcode, SLA value, or the hospital geographical indicator variable where: 0 = Major City; 1 = Inner Regional; 2 = Outer Regional; 3 = Remote; and 4 = Very Remote.
S02	_treat_remoteness	Patient Treatment Remoteness Area	2011 ASGS Remoteness Area category of the patient treatment location taken from the hospitals geographic location information, where: 0 = Major City; 1 = Inner Regional; 2 = Outer Regional; 3 = Remote; and 4 = Very Remote.
S03	_pat_subacute_flag	Subacute and non-acute patient flag	1 if Care Type = 2, 3, 4, 5 or 6, else 0.
S04	_pat_los	Length of stay	Max (1, (Date of Separation) - (Date of Admission) - (Total Leave Days)).
S05	_pat_sameday_flag	Patient same-day flag	1 if Date of Admission = Date of Separation; else 0.
S06	_pat_age_years	Age at admission (in years)	Total whole years from Date of Birth to Date of Admission.
S07	_pat_eligible_paed_flag	Paediatric Adjustment eligible patient	Patients with age less than or equal to 17 and in a Palliative care type.
S08	_pat_ind_flag	Indigenous patient flag	1 if Patient Indigenous Status = 1, 2 or 3; else 0.
S09	pat_private_flag	Private patient flag	1 if Funding Source = 9 or 13 for 2013-14 data and later.[21]
S10	pat_public_flag	Public patient flag	1 if Funding Source = 1, 2, 3 or 8 for 2013-14 data and later.[22]
S11	ansnap_type	See definition	AN-SNAP class type, as set out in Appendix I of the NEP19 Determination
S12	ansnap_samedaylist_flag	Same-day price list flag	1 if Same-Day Price List variable from joined NWAU AN-SNAP Price Weight table equals 'Yes'; else 0.

[21] Or 1 if Funding Source = 2 or 3 for 2011-12 data or earlier.
[22] Or 1 if Funding Source = 1, 10 or 11 for 2011-12 data or earlier.

Variable	Name	Description	Definition
S13	_pat_radiotherapy_flag	Radiotherapy eligible separation. Either supplied in the input dataset or derived from the list of supplied procedure codes.	1 if patient had radiotherapy related treatment or planning procedure; else 0.
S14	_pat_dialysis_flag	Dialysis eligible separation. Either supplied in the input dataset or derived from the list of supplied procedure codes.	1 if patient had a dialysis procedure; else 0.
S15	ansnap_inlier_lb	Inlier lower bound	Inlier lower bound from NWAU AN-SNAP Price Weight table.
S16	ansnap_inlier_ub	Inlier upper bound	Inlier upper bound from NWAU AN-SNAP Price Weight table.
S17	ansnap_pw_sd	Same Day Price Weight	(same day price weight from joined NWAU AN-SNAP Price Weight table) if not missing; else missing.
S18	ansnap_sso_perdiem	Short Stay Outlier Per Diem Price Weight	(short stay outlier price weight from joined NWAU AN-SNAP Price Weight table) if not missing; else missing.
S19	ansnap_pw_inlier	Inlier Price Weight	(inlier price weight from joined NWAU AN-SNAP Price Weight table) if not missing; else missing.
S20	ansnap_pw_lso_perdiem	Long Stay Outlier Per Diem Price Weight	(long stay outlier price weight from joined NWAU AN-SNAP Price Weight table) if not missing; else missing.
S21	paed_pw_sameday	Same day price weight for paediatric patients	(paediatric same day price weight from joined care type Price Weight table) if not missing; else missing.

Variable	Name	Description	Definition
S22	paed_overnight_perdiem	Overnight price weight for paediatric patients	(paediatric overnight price weight from joined care type Price Weight table) if not missing; else 0.
S23	adj_indigenous	See definition	Indigenous adjustment.
S24	adj_remoteness	See definition	Remoteness adjustment.
S25	caretype_adj_privpat_serv	See definition	Private patient service adjustment (care type specific adjustment).
S26	state_adj_privpat_accomm_sd	See definition	Private patient accommodation adjustment: same-day rate (state-specific adjustment).
S27	state_adj_privpat_accomm_on	See definition	Private patient accommodation adjustment: overnight per diem rate (state-specific adjustment).
S28	Error_code	See definition	Outlines Errors in calculations
S29	_pat_separation_category	See definition	Patient separation category: 0: Valid Paediatric patients 1: Same day patients 2: Short Stay outlier patients 3: Inlier patients 4: Long stay outlier patients
S30	_w01	AN-SNAP inlier/outlier weight	Based off _pat_separation_category: 0: _pat_sameday_flag*paed_pw_sameday+(1-_pat_sameday_flag)*_pat_los*paed_ overnight_perdiem 1: ansnap_pw_sd 2: ansnap_pw_sso_perdiem * pat_los 3: ansnap_pw_inlier 4: ansnap_pw_inlier + (pat_los - ansnap_inlier_ub) * ansnap_pw_lso_perdiem
S31	GWAU19	Gross weighted activity Unit	_w01*(1+adj_indigenous+adj_remoteness+adj_radiotherapy+adj_dialysis)*(1+adj_treat_remoteness)
S32	_adj_privpat_serv	Private Patient Service adjustment	_pat_private_flag *caretype_adj_privpat_serv*(_w01)
S33	_adj_privpat_accom	Private Patient Accommodation adjustment	_pat_private_flag*(_pat_sameday_flag*state_adj_private_accom_sd+(1-_pat_sameday_flag)*_pat_los*state_adj_privpat_accomm_on)

Variable	Name	Description	Definition
S34	adj_radiotherapy	See definition	Radiotherapy adjustment.
S35	adj_dialysis	See definition	Dialysis adjustment.
S36	adj_treat_remoteness	See definition	Patient treatment remoteness adjustment.
S37	NWAU19	National weighted activity unit	Max(0, GWAU19- _adj_privpat_serv-_adj_privpat_accomm) for only in-scope funding sources

Table 25: Emergency department: variable definitions.

Variable	Name	Description	Definition
E01	_UDG	UDG v1.3	Either supplied directly or derived from DSS variables: type of visit to Emergency Department, triage category, and episode end status. See IHPA website for details.
E02	_pat_ind_flag	Indigenous patient flag	1 if Patient Indigenous Status = 1, 2 or 3; else 0.
E03	_pat_remoteness	Patient Remoteness Area	2011 ASGS Remoteness Area category of the establishment location taken from patient postcode, ASGS, SLA, or the hospital geographical indicator variable, where: 0 = Major City; 1 = Inner Regional; 2 = Outer Regional; 3 = Remote; and 4 = Very Remote.
E04	_treat_remoteness	Patient Treatment Remoteness Area	2011 ASGS Remoteness Area category of the patient treatment location taken from the hospitals geographic location information, where: 0 = Major City; 1 = Inner Regional; 2 = Outer Regional; 3 = Remote; and 4 = Very Remote.
E05	_pat_age_years	Age at admission (in years)	Total whole years from Date of Birth to Date of Admission.
E06	_pat_age_grp	See definition	If _pat_age_years less than 65 then group = 0; else if _pat_age_years less than or equal to 79 then group = 1; else if _pat_age_years greater than or equal to 80 then group = 2; else if missing (_pat_age_years) equals 1 the group =0
E07	UDG_PW	See definition	UDG price weight, taken from NWAU Price Weight table.
E08	URG_PW	See definition	URG price weight, taken from NWAU Price Weight table.
E09	adj_indigenous	See definition	Indigenous adjustment from NWAU Adjustment table.
E10	adj_remoteness	See definition	Remoteness adjustment.
E11	adj_treat_remoteness	See definition	Patient treatment remoteness adjustment.
E12	adj_age	See definition	Age adjustment from NWAU Adjustment table.
E13	Error_Code	See definition	Outlines Errors in calculations

Variable	Name	Description	Definition
E14	_w01	Base predicted	Adopt URG_PW if available else UDG_PW
E15	GWAU19	Gross Weighted Activity Unit	_w01*(1+adj_indigenous+adj_remoteness)*(1+adj_age)*(1+adj_treat_remoteness)
E16	NWAU19	National Weighted Activity Unit	GWAU19 for in-scope patients only (i.e. non DVA and Compensable patients)

Table 26: Non-admitted: variable definitions.

Variable	Name	Description	Definition
N01	_pat_ind_flag	Indigenous patient flag	1 if Patient Indigenous Status = 1, 2 or 3; else 0.
N02	_pat_remoteness	Patient Residential Remoteness Area	2011 ASGS Remoteness Area category of the patient location taken from the episode's geographical information in ranked order of preference: SA2, postcode, SLA value, or the hospital geographical indicator variable where: 0 = Major City; 1 = Inner Regional; 2 = Outer Regional; 3 = Remote; and 4 = Very Remote.
N03	_treat_remoteness	Patient Treatment Remoteness Area	2011 ASGS Remoteness Area category of the patient treatment location taken from the hospitals geographic location information, where: 0 = Major City; 1 = Inner Regional; 2 = Outer Regional; 3 = Remote; and 4 = Very Remote.
N04	clinic_pw	See definition	Tier 2 Clinic price weight, taken from NWAU Price Weight table.
N05	adj_indigenous	See definition	Indigenous adjustment from NWAU Adjustment table.
N06	adj_remoteness	See definition	Remoteness adjustment.
N07	adj_treat_remoteness	See definition	Patient treatment remoteness adjustment.
N08	Adj_multiprov	See definition	Multidisciplinary adjustment.
N09	Error_Code	See definition	Outlines Errors in calculations
N10	GWAU19	Gross Weighted Activity Unit	clinic_pw*(1+adj_indigenous+adj_remoteness)*(1+adj_multiprov)*(1+adj_treat_remoteness)
N11	NWAU19	National Weighted Activity Unit	GWAU19 for in-scope funding sources

Appendix C: Summary of input data

Table 27: Summary of 2015-16 and 2016-17 patient-costed NHCDC data (ABF hospitals).

	Establishments			(Separations/Episodes)			Total Reported In-scope Cost		
	2015-16	2016-17	% Change	2015-16	2016-17	% Change	2015-16	2016-17	% Change
Acute	242	253	4.6%	5.4M	5.8M	7.8%	$25.8B	$28.2B	9.2%
Emergency	185	192	3.8%	7.0M	7.3M	4.7%	$4.4B	$4.7B	7.6%
Non-admitted	213	224	5.2%	17.6M	18.3M	4.4%	$5.1B	$5.4B	7.1%
Subacute	234	241	3.0%	177.8K	174.3K	-1.9%	$2.4B	$2.4B	0.8%

Table 28: Summary of 2015-16 and 2016-17 population data (ABF hospitals).

	Establishments			Activity (Separations/Episodes)		
	2015-16	2016-17	% Change	2015-16	2016-17	% Change
Admitted acute	268	274	2.2%	5.6M	6.0M	6.8%
Emergency	191	193	1.1%	7.4M	7.5M	1.3%
Non-admitted						
Subacute	258	255	-1.2%	189.8K	186.2K	-1.9%

Table 29: Costed (NHCDC) sample as proportion of total population.

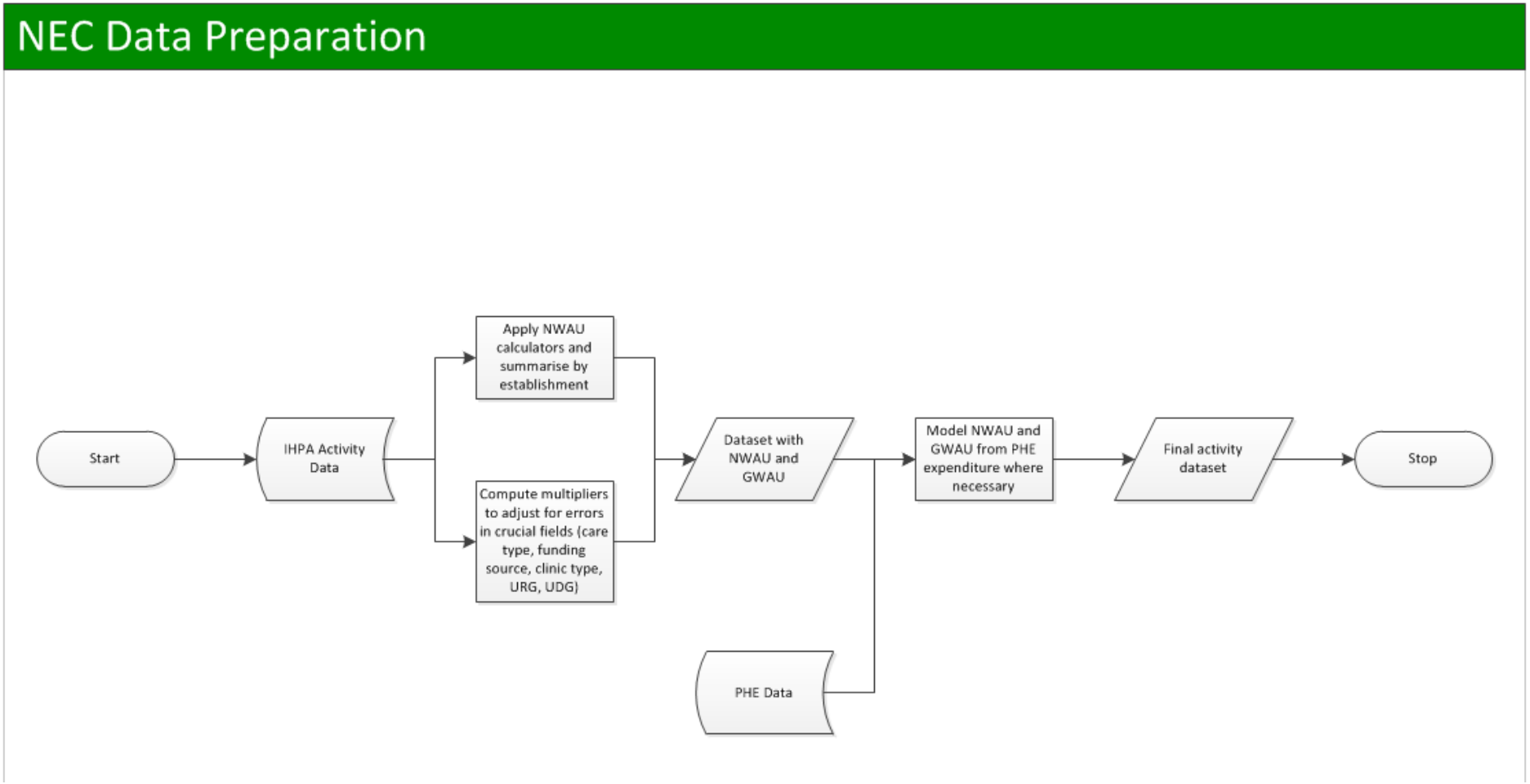
	Establishments		Activity (Separations)	
	2015-16	2016-17	2015-16	2016-17
Admitted acute	90.3%	92.3%	96.0%	96.9%
Emergency	94.8%	97.4%	93.8%	97.0%
Non-admitted				
Subacute	89.5%	92.2%	82.0%	83.2%

Note: Only the NHCDC activity is used in the non-admitted Cost Model.

Appendix D: List of DRGs adopting the L1.5 H1.5 methodology

DRG	DRG Description
H06A	Other Hepatobiliary and Pancreas GIs, Major Complexity
I12A	Misc Musculoskeletal Procs for Infect/Inflam of Bone/Joint, Major Complexity
I32A	Revision of Knee Replacement, Major Complexity
P02Z	Cardiothoracic and Vascular Procedures for Neonates
P03A	Neonate, AdmWt 1000-1499g W Significant GI/Vent>=96hrs, Major Complexity
P05A	Neonate, AdmWt 2000-2499g W Significant GI/Vent>=96hrs, Major Complexity
P66A	Neonate, AdmWt 2000-2499g W/O Significant GI/Vent>=96hrs, Extreme Comp
R06A	Autologous Bone Marrow Transplant, Major Complexity
R60A	Acute Leukaemia, Major Complexity
T64A	Other Infectious and Parasitic Diseases, Major Complexity
Y02A	Skin Grafts for Other Burns, Major Complexity

Appendix E: NEC19 data preparation



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