

Health Workforce Australia National Training Plan

Methodology Paper

© Health Workforce Australia

This work is Copyright.

It may be reproduced in whole or part for study or training purposes.

Subject to an acknowledgement of the source, reproduction for purposes other than those indicated above, or not in accordance with the provisions of the *Copyright Act 1968*, requires the written permission of Health Workforce Australia (HWA).

Enquiries concerning this report and its reproduction should be directed to:

Health Workforce Australia
GPO Box 2098
Adelaide SA 5001

Telephone: 1800 707 351
Email: hwa@hwa.gov.au
Internet: www.hwa.gov.au

Suggested citation:
Health Workforce Australia 2011: National Training Plan – Methodology Paper

Contents

Executive Summary	4
Background.....	5
1 Introduction to the National Training Plan methodology	6
2 Considerations in model selection	8
2.1 Data considerations	8
2.2 Projection period	8
3 Model components	10
4 Detailed discussion of model components	12
4.1 Demand Methodology	12
4.2 Demand data, method by profession and specialty	12
4.3. Unmet demand.....	15
4.4 Supply	16
4.5 Sensitivity analysis	18
4.6 Diagrammatic representation of the model inputs and data flows	19
4.7 Model inputs and data flows.....	21
5 Analysing the findings.....	27
5.1 Baseline analysis	27
5.2 Alternative Scenarios	28
Appendix A - Medical and Nursing Specialities	30
Appendix B – Supply and demand data sources	30
Essential workforce supply data items.....	31
Essential workforce demand data items	33

Executive Summary

The Australian Health Ministers' Conference (AHMC) has commissioned Health Workforce Australia (HWA) to develop a National Training Plan and report to AHMC by the end of 2011. The development of a National Training Plan ('the Plan') is being undertaken by HWA to assist in achieving a goal of self-sufficiency in the supply of doctors, nurses and midwives by 2025 within a global health labour market.

The initial outputs of the Plan represent the first step in an ongoing process intended to continually improve forecast estimations through identification and improvement of shortcomings in the available data and current methodology through engagement with health stakeholders. The plan has an emphasis on evidence based approaches to scenario assumptions. It is intended that the Plan would initiate a dynamic process in which estimates would be updated with new data each year, and the modeling assumptions would be systematically reviewed less frequently. This will ensure that the planning remains relevant over time and is able to take account of significant workforce and health system changes.

The principal method used to develop the Plan is mathematical simulation modelling together with scenario analysis. The purpose of the simulation modelling is to transform our knowledge of the current supply and demand of doctors, nurses and midwives into projections of likely trends in health workforce supply and demand, allowing us to identify any under-supply or oversupply gaps that could arise in future.

Broadly, the modelling in the initial stage will include the following:

- Constructing a baseline (including supply modelling)
- Demand modelling
- Conducting a broad range of sensitivity analysis
- Planning scenario modelling

The baseline will be constructed using existing data and will be a "status quo" scenario, i.e. it will assume that the future will mirror the past in terms of workforce configuration and distribution. Modelled changes over time will be as a result of demographic change. The purpose of the baseline is not to provide a set of predictions about future workforce needs but to provide a comparison against which the alternative planning scenarios can be evaluated.

The workforce study requires a range of data inputs derived from several sources together with a detailed knowledge and understanding of the source data sets and individual data items. The extent of our ability to accurately model the future health workforce requirements to achieve self-sufficiency will be entirely dependent on the quality and availability of data relevant to those questions – particularly in the context of jurisdictional level and specialty level modelling.

In terms of supply data, the data inputs will include those relating to labour force characteristics (both current and future, i.e. students, trainees and interns) across a wide range of factors impacting on workforce availability, numbers and distribution. Demand data in the initial stage will cover population demographics and transitions over time as well as consideration of changes in patterns of disease. Key transition rates for the modelling will be constructed and derived from these data sets for input into the creation of a baseline model.

Significance analysis to determine the sensitivity of modelling outputs to changes in input variables will be undertaken to enhance the transparency of the modelling and to assist in building reliability and credibility in outcomes generated.

A second phase of the Plan will include a "training pipeline" analysis to determine the numbers of students, graduates and trainees required to achieve the balanced numbers of doctors, nurses and midwives and the rate at which new professionals can be trained. The methodology for the second phase is not discussed in this paper but will be the subject of a future paper.

Background

The development of a National Training Plan ('the Plan') is being undertaken by Health Workforce Australia (HWA) to assist in achieving a goal of self-sufficiency in the supply of doctors, nurses and midwives by 2025. Self-sufficiency is defined as a situation in which Australia's requirements for medical, nursing and midwifery professionals in 2025 can be met from the supply of domestically trained graduates without the need to import overseas trained doctors, nurses and midwives to meet a supply gap. Note that this does not imply that there would be no international movement of doctors, nurses and midwives.

The Plan will provide the estimated numbers of professional entry, postgraduate and specialist trainees that will be required between 2012 and 2025 to achieve the self-sufficiency goal. While seeking to achieve self-sufficiency, the Plan recognises that Australia exists within a global health labour market and accompanying labour flows.

The Australian Health Ministers' Conference (AHMC) commissioned HWA to develop the National Training Plan and report to AHMC by the end of 2011.

The importance of undertaking national planning for a sustainable health workforce in Australia for the first time has been broadly recognised by the community, governments, health service providers and the professions.

A 2010 World Health Organisation (WHO) report on health workforce planning notes that "...to be most effective, health workforce planning and projections should be viewed as an iterative process in which the ability to measure and tell the performance story improves over time." (Models and Tools for Health Workforce Planning and Projections, 2010)

National health workforce planning in Australia has been hampered in the past by a lack of a single comprehensive data source on the numbers and types of health professionals working in Australia.

The development of the National Training Plan is a significant first step towards the improvement of health workforce planning in Australia. It will enable us to move from short term, year on year adjustments to health workforce training to the adoption of a long term view enabling Australia to become self-sufficient in the supply of doctors, nurses and midwives.

1 Introduction to the National Training Plan methodology

The central research question to be addressed by the Plan is *"what is the number of medical, nursing and midwifery professionals required to meet the goal of self-sufficiency by 2025?"*. This question will be answered through the process of health workforce planning. In the context of the Plan, health workforce planning is the process of estimating the size, type (for medical practitioners, nurses and midwives) and geographical distribution of the health workforce needed to meet future service requirements.

Self-sufficiency is defined as a situation in which all of Australia's requirements for medical, nursing and midwifery professionals in 2025 can be met from the supply of domestically trained graduates without the need to import overseas trained doctors, nurses and midwives to meet a supply gap.

The Plan will operationalise the concept of self-sufficiency through the use of three different models to demonstrate potential ranges:

- Minimum self-sufficiency - the current reliance on overseas trained professionals does not increase in future, but is held at a constant level. i.e. net migration is held at current levels
- Medium level self-sufficiency - the aim is to reduce current reliance on overseas trained professionals by 50% by 2025
- High level self-sufficiency - the aim is to reduce current reliance on overseas trained professionals, but acknowledging that there will continue to be normal movement of health professionals in and out of the country, therefore setting the reduction target at 95%

It is important to note that the target of achieving high level self-sufficiency does not imply that there would be no intake of foreign-trained health professionals in 2025, as a continued flow of foreign-trained health professionals may occur for a range of reasons other than to meet a demand gap.

The Plan will also incorporate two scenarios to show the impact of international students in future workforce planning. The scenarios will build in assumptions based on international student trends, such as the proportion of students who stay in Australia versus those who return to their home country once their studies are completed.

Health workforce planning in the context of the Plan is the process of estimating the size, type (for medical practitioners, nurses and midwives) and jurisdictional distribution of the health workforce needed to meet future service requirements. In the second phase of the modelling, this will include the modelling of a "training pipeline" necessary to meet the requirements identified in the initial phase. Initially, the health workforce modelling will provide information about the likely pattern of workforce shortages or over-supply for medical practitioners, nurses and midwives through to 2025 on firstly a specialty basis and secondly on a jurisdictional basis.

The principal method used to develop the Plan is mathematical simulation modelling together with scenario analysis. The purpose of the simulation modelling is to transform our knowledge of the current supply and demand of doctors, nurses and midwives into projections of likely trends in health workforce supply and demand, allowing us to identify any under-supply or oversupply gaps that could arise in future.

Adjustments can then be made to achieve a balance in the supply and demand for domestically-trained medical, nursing and midwifery professionals by 2025. For the purposes of the second phase of the Plan, the simulation modelling will include a "training pipeline" analysis. This allows us to determine the numbers of students and trainees required to achieve the balanced numbers of doctors, nurses and midwives and the rate at which new professionals can be trained. Note that this paper does not discuss the detailed method for carrying out the pipelining analysis. This enhancement to the planning model will be the subject of a future methodology paper.

Scenario analysis allows us to select a number of "what if" situations and model their effects. This allows for the examination of potential future changes such as system constraints (e.g. financial or capacity); variations in demand resulting from changes to the characteristics of the population (e.g. an ageing population); changes to the need for professionals resulting from technological advances or other innovations; or changes to labour dynamics such as the retention of early career nurses and midwives. Scenario analysis will allow the Plan to examine a number of possible futures and to plan for them.

The modelling of the health workforce for the purposes of the Plan is being assisted through the engagement of a Technical Reference Group (TRG). The TRG is composed of representatives from academia,

government and the health sector who have and will continue to provide advice and expertise on a variety of issues including:

- Testing the appropriateness of modelling assumptions;
- Informing on the suitability and feasibility of demand modelling methodologies
- Providing advice on best practice approaches to quantifying education and training capacity, modelling workload measures and incorporating distributional and access issues;
- Assisting in the formulation and construction of scenarios to be modelled; and
- Identifying relevant literature and alternative data sources including national and international workforce studies to better inform modelling approaches.

2 Considerations in model selection

There is no single technique appropriate for all types of health workforce modelling. Factors considered in the choice of approach to workforce projections included:

- The quality, completeness and level of aggregation of the data sets available;
- Where multiple data sets are relied upon, the number of common variables between the data sets;
- The period over which a forecast is required;
- The degree to which the factors causing change over time ('drivers') are known;
- The extent of structure in the data such as cyclical, seasonal, trend and random characteristics; and
- The nature and flexibility of scenario modelling required.

The approach chosen for workforce projections as outlined in this paper, was determined to best address the considerations outlined above.

2.1 Data considerations

The data sources available to HWA vary significantly in terms of their frequency, source and length of time series available. Many sources are only newly available, are only partially complete (due to the need to gather data over an extended period) or are collected infrequently. The extent of our ability to accurately model the future health workforce requirements to achieve self-sufficiency is entirely dependent on the quality and availability of data relevant to those questions.

A key first step is to assess the availability, coverage and quality of the data items which are essential for estimating the current workforce and forecasting the future workforce.

Appropriate data types, sources (known and potential), historical coverage and formats required for each aspect of the modelling work have been identified and are contained in Appendix B.

Where the process of selecting input data identified data gaps, options for addressing the gaps were considered and assessed on the basis of the:

- Type of information required;
- The collection method/s;
- Required tools and infrastructure;
- Resource cost and time requirements; and
- Future potential, for example the setting up of a survey to be conducted annually or at longer intervals to provide ongoing information.

HWA will continue to augment and refine the capabilities of the model over time to reflect the accumulation of additional datasets, changes in underlying demand and supply factors and the requirement for finer levels of detail (for example, modelling regional versus metropolitan service levels).

2.2 Projection period

The Plan projection period is predominantly concerned with achieving self-sufficiency by the end of the 2012-2025 period. The projections will be undertaken in such a way that self-sufficiency once achieved is maintained indefinitely.

In any projection, the time frame over which workforce supply and demand will be calculated will be necessarily influenced by the following two factors:

- Projections become less accurate as the period of time over which they apply increases. This is due to both to the error inherent in any projection methodology but also to changes in technology or other factors which, over an extended period, are likely to change the relationship between type and number of services provided per workforce participant; and
- The reliability of data on which projections are made may change with time for different data sets. For very long-term projections (for example several decades), estimates of future population may be

more reliable than estimates of graduate recruitment. However, population may be only a minor factor compared with graduate recruitment in shaping workforce supply over a short term period (for example one to two years).

The meaningfulness of long-term projections generated will in part depend on the quality of the data upon which those projections are being made, and less robust data may limit the projection period.

3 Model components

The HWA National Health Workforce Planning Tool ('the Tool') will be used to develop (in the first instance) a set of national supply projections and associated sensitivity analyses. The Tool is based on a standard "Markov chain" analysis that develops transition matrices based on workforce characteristics, such as participation rates in age and gender cohorts, and calculates change rates by cohort by year for each of the input/output factors. These projections of supply are then compared against projections of demand. If demand is greater than supply in a given year, this is used as an estimate of the number of new targets/training places required.

The Tool will be enhanced in the second phase to model the number of training places required within the education and clinical training sectors to support the required set of medical, nursing and midwifery professionals (i.e. the number of professional entry, graduates, pre-vocational, basic and advanced specialist training places required each year in order to have available the target number of medical, nursing and midwifery professionals) under each planning requirement. In order to provide the detailed estimates of demand for each area of specialisation it will be necessary to supplement this information with both detailed data and expert advice. In the second phase of the project the Tool will be further enhanced to produce the training "pipeline" estimates. The method for this will be presented in a future paper.

The Tool will also be enhanced to take account of a range of methodological issues raised by Scott and Sivey in their report 'Refining the National Workforce Planning Model'.

Broadly, the initial stage will include the following:

- Supply modelling

This will involve establishing an estimate of the size of the doctor, nurse and midwifery workforces, their characteristics, mix and distribution for the initial or base year of the study and then projecting that supply forward to establish the overall level of medical, nursing and midwifery professionals through to the year 2025. These projections will then be used to determine the number of training places and graduates required to maintain the current level of service provision within each profession. In addition, these projections will be broken down further by geographical area, including jurisdiction and also by major specialty (in medicine) and nursing area such as aged care and mental health. The purpose of the baseline scenario is to establish the need for doctors, nurses and midwives under a status quo assumption, i.e. a scenario in which the operation of the health and education systems are unchanged from the present.

Medical specialty workforce projections are limited to those with sufficient volume at a national level for meaningful projections. For the purpose of modelling, a specialty field requires 500 or more professionals practising nationally to be considered. The minimum is set to preserve the integrity of the model projections when the specialty is further broken down into age, gender and jurisdiction workforces. The specialities to be modelled are listed in appendix A.

The specialty areas to be modelled in the nursing workforce are Acute, Mental health, and Aged Care.

- Demand modelling

The initial stages of modelling will also include consideration of variations to anticipated requirements under assumptions of high, current and low demand. This will allow us to determine the sensitivity of the model (and hence the health system) to changes in the level of demand over time, and the different requirements for health professionals in these circumstances. The demand for health professionals can vary as a function of changes in population characteristics, changes to expectations of care, new models of care or workplace changes due to workforce reform that result in an increase or decrease in the relative requirement for certain professions.

The development of specific demand projections will be informed by expert groups and will be established within each area of specialisation to assist HWA in developing an agreed level of demand under each of the planning scenarios.

- Sensitivity analysis

Conducting a broad range of sensitivity analysis allows us to demonstrate which variables and parameters have the most significant impact on the overall modelling results. These sensitivity analyses will provide measures of elasticity (i.e. the expected output impact of a standardised percentage change in an input variable on both supply and demand factors).

For example if all input variables were changed by 1%, the related changes in the output values of these variables may vary. The variables that respond with the most significant changes help to highlight which data sets should be a future priority in terms of improving data availability and quality as well as guiding the formulation of alternative scenario models.

- Planning scenario modelling

A limited number of alternative scenarios will then be developed based on consultation, in particular, the use of a series of stakeholder workshops in which the baseline scenario and alternative scenarios will be examined in detail. These alternative scenarios will be modelled using the Planning Tool to enable an analysis of the impact on the health workforce requirements.

Under each planning scenario the questions to be addressed are:

- How many professionals will be required in each profession and area of specialty (at the level modelled in the initial stage) in 2025?
- In order to achieve the required number in each profession, how many graduates and specialisation training places will be required in each year from 2012, at undergraduate, post-graduate and specialist training levels?
- What is the current and likely future capacity of the training system?
- What are the barriers to increasing the number of training places?

Pipelining analysis

In the final phase of the development of the Plan a pipelining analysis will be conducted for each of the planning scenarios. This will provide, for each scenario, the numbers of students and trainees that will be required in each year to meet the final goal. This analysis will also show the number of students and trainees that can be produced each year under current conditions, revealing along the way any training shortfall between supply and demand. The pipeline analysis will consider professional entry students and their clinical training requirements as well as the training requirements of postgraduate pre-vocational medical trainees and specialist trainees and postgraduate specialty areas for nursing and midwifery within the scope of the Plan. The pipelining method will be described in detail in a future methodology paper.

4 Detailed discussion of model components

4.1 Demand Methodology

The approach to demand modelling will be to use hospital (public and private) acute and sub-acute forecasting data which applies current utilisation rates (at the age/sex/specialty level). This method will be used for acute hospital separations. For non-hospital separations we will be using the same method (utilisation at age/sex/specialty) but using Medicare data.

Midwifery demand will be built up from a number of non-hospital demand indicators, such as births per birth unit from birthing units and fertility rates from the ABS with the same utilization method as the other professions then applied to it.

Projection Method

The basic methodology will apply projected clinical trends to projected populations in both hospital and community settings. This is undertaken at a detailed level and assumes that clinical trends observed in the past will be maintained. In addition to data on acute hospital separations, data will be used from Medicare to measure demand in community settings

Change in underlying admission and consultation rates are an important determinant of total demand. Change in rates may reflect a variety of influences including changes in technology (investigations, radiology, pathology, drugs, medication, and surgical techniques), changes in community expectations, funding trends and supply of services. While it is not possible to disaggregate these influences, it is important to account for them. Care must be taken not to extrapolate recent trends indefinitely where there is good (historical) reasons to believe such trends will not continue or will revert to a long-term average.

Demand projections need to be analysed and understood in terms of both the demographic (population growth and ageing) and non-demographic (changes in clinical practice, admission rates, expectations etc.) components.

Linear regression is the underlying method used in projecting future demand rates. They are based upon linear regression if the trend is upwards, and exponential decline (with a lower limit of 1 day) if the trend is downwards.

However, experience has shown that in certain cases such an approach can lead to untenable results. In some cases, single data points in the series may be much higher or lower than the succeeding points and not be representative of the underlying trend; such a "pivot" point can unduly influence the regression results.

To reduce the occurrence of such unrealistic projections of regressions done at fine levels of detail, a simple algorithm is used to limit the growth or decline in demand.

In the following sections this overall method is explained in more detail for each of the professions and specialties under review.

4.2 Demand data, method by profession and specialty

Nursing and Midwifery

The approach to be used for estimating demand for nursing and midwifery will comprise of a blended method, with the use of different data items being utilised for the identified nursing and midwifery areas (see table 2 below).

The method to be used for estimating demand for the acute area of nursing will chiefly use the Hards and Associates forecasting method, which applies current utilisation rates (at the age/sex/specialty level) to projected population. The basic methodology is to apply projected clinical trends (admission rates and average length of stay) to projected population growth from the ABS.

For the high dependency, critical care and emergency nursing area, the Hards and Associates forecasting method will be the main method used to estimate the demand, but will be based on the appropriate DRGs related to this nursing specialty. Another data source that will be factored into this demand estimate will be data from the Australia New Zealand Intensive Care data related to Intensive Care, particularly for beds and staffing.

In the case of the aged care nursing, there are a number of hospital and non-hospital demand dimensions that will need to be considered. This specialty is split across sectors, acute, sub-acute and non-hospital settings, some of which lack complete data sources. The approach will involve using the Hardes and Associates forecasting method for the acute inpatients for aged care, with a particular focus on the residential aged care high and low care bed days. In addition to investigating the service demand and forecasting for residential aged care services, forecasts of service demand will be based upon forecasts of aged population growth and existing Commonwealth norms regarding bed number per thousand people aged 70+ years. In addition the analysis of the nursing workforce proportions (i.e. with respect to AINs, PSA/PCAs etc.) in the aged care sector will need to be factored into the demand estimate for this nursing specialty.

While the mental health nursing area lacks complete data sources there are still a number of non hospital nursing demand approaches that will be considered for the service demand and forecasting for mental health, where forecasts of service demand will be based upon the national mental health dataset and apply the same utilisation method.

The approach to service demand forecasting for the registered and enrolled nurse (not by the area groups listed above) has limited data sources, which means that to in order to determine the demand estimate the number of nursing FTE per head of population will need to be calculated using community based service data.

A large proportion of midwifery also lacks complete data sources; however there are a number of non-hospital demand sources that can be consulted to determine the demand estimate. These include sources such births per birth unit from birthing units and fertility rates from the ABS and apply the same utilisation method.

Table 2 – Demand data items (nursing and midwifery)

Nursing specialty	Data items to be included	Method
Acute	Hardes forecasting method	Utilisation - Bed days by population,
High dependency, critical care and emergency	Hardes forecasting method Australia New Zealand Intensive Care data	DRGs; separations for emergency Beds and staffing
Aged care	Hardes forecasting method AIHW	Residential aged care: high and low care bed days Proportions of the workforce within nursing i.e. AINs and PSAs Population based demand – ageing profiles and workforce mix
Mental health	National Health Survey Data Mental Health dataset (DOHA) AIHW	Need data on increasing demand and the trend data Labour force survey Inpatient and community data is required for this category Establishments of data
Midwifery	AIHW ABS (birth rate, fertility rates)	Labour force survey Hospital data Data from birthing units Fertility rates

Medical

For the medical workforce, the demand modelling process is being undertaken using a blended demand method approach. The bulk of the medical specialties are to be modelled using acute hospital demand measures with adjustment where there are significant differences in the specific data characteristics or data availability for a given specialty. In several cases, this has implications for the way in which projections for that specialty can be effectively modelled and will therefore be taken into account in terms of the specific method to be applied in projections for that specialty.

The most distinct treatment of the medical specialties is applied to General Practice where community demand estimates will be based on Medicare data. This blend of methods represents an attempt – in the context of medical workforce modelling – to apply the method with the best ‘fit’ to the relevant medical specialty. It is recognised that each of these approaches will represent a starting point for future demand modelling for medical specialties, with significant scope for future improvement as new datasets, modelling approaches and stakeholder input are continuously incorporated.

The demand measurement will use two main sources. For acute hospital utilisation rates, separations data will form the basis of calculating a utilisation rate (by age/sex/specialty) to then be projected into the future. For non-hospital utilisation rates of services, Medicare data will be used as the closest available analogue of separations data for that particular sector.

Once the base utilisation rates have been constructed using the data sources identified above they will be projected into the future using the linear regression method described in Section 4.1 – subject to the constraints on total growth where particularly large trends in either growth or decline have been captured in recent trend data. This will apply the identified trends in utilisation by specialty to forecast population growth to arrive at a projected utilisation rate for each specialty by each projection year. Note that for many of these specialties (as indicated in the table below), this base regression method will be augmented with specific data methods where this has already been identified as a more appropriate approach.

Once developed, the specific demand estimates on a per specialty basis will be applied to the data input module to be processed in running the workforce modelling to yield estimated workforce demand per specialty on an annual basis over the entire projection period.

Table 3 – Demand data items (medical)

Medical specialty	Data items to be included	Method
Anaesthesia	Medicare data Hospital utilisation forecast model ANZSICS	MBS and indirect PBS Extract for specialty by year – net number of services Geographic distributions
Emergency and Intensive care medicine	Medicare data ANZSICS	As above
General Practice	Medicare data	Utilisation – Age/Sex adjusted
Obstetrics & Gynaecology	Hospital utilisation forecast model Medicare data	Separations Data Forecast population growth data Utilisation – Age/Sex adjusted
Ophthalmologists	Hospital utilisation forecast model Medicare data	Separations Data Forecast population growth data Utilisation – Age/Sex adjusted
Paediatrics and child health	Hospital utilisation forecast model Medicare data	Separations Data Forecast population growth data Utilisation – Age/Sex adjusted

Medical specialty	Data items to be included	Method
Pathologists	Hospital utilisation forecast model Medicare data	Separations Data Forecast population growth data Utilisation – Age/Sex adjusted
Psychiatrists Awaiting more information	Hospital utilisation forecast model Medicare data	Separations Data Forecast population growth data Utilisation – Age/Sex adjusted
Radiologists	Hospital utilisation forecast model Medicare data	Separations Data Forecast population growth data Utilisation – Age/Sex adjusted
Physicians (all 17 specialty fields together)	Hospital utilisation forecast model Medicare data	Separations Data Forecast population growth data Utilisation – Age/Sex adjusted
Cardiology	Hospital utilisation forecast model Medicare data	Separations Data Forecast population growth data Utilisation – Age/Sex adjusted
Gastroenterologists	Hospital utilisation forecast model Medicare data	Separations Data Forecast population growth data Utilisation – Age/Sex adjusted
General medicine	Hospital utilisation forecast model Medicare data	Separations Data Forecast population growth data Utilisation – Age/Sex adjusted
Surgery (all 11 specialty fields)	Hospital utilisation forecast model Medicare data	Separations Data Forecast population growth data Utilisation – Age/Sex adjusted
Orthopaedic surgery	Hospital utilisation forecast model Medicare data	Separations Data Forecast population growth data Utilisation – Age/Sex adjusted
General surgery	Hospital utilisation forecast model Medicare data	Separations Data Forecast population growth data Utilisation – Age/Sex adjusted

4.3. Unmet demand

A critical issue for consideration in modelling health workforce demand is the management of current unmet demand. Crucial issues that arise include:

- Conceptual definition of what constitutes unmet demand;
- Availability and quality of data; and

- The special case of shortages arising from distributional issues.

Each of these issues and the way in which they are being addressed in this modelling approach are discussed below.

- Conceptual definition of what constitutes unmet demand

By necessity, the determination of a pre-existing unmet demand implies a known and knowable level of existing supply and demand. Many of the issues and uncertainties surrounding the estimate of these quantities are dealt with elsewhere in this paper. Conceptually, there remains a significant degree of ambiguity in terms of health workforce demand and supply estimation as a consequence of the particular structure of the 'market' for health services.

Within these constraints and for the purposes of the initial modelling, the conceptual definition of unmet demand will therefore be defined as a specialty group where there is a clear evidence base of a non-localised and persistent shortage of services provided by that specialty not directly related to policy or budgetary induced constraints. As discussed in the following sections, these conceptual difficulties, the availability and quality of relevant data as well as distributional issues make the determination of the quantum of unmet demand a complex problem.

HWA is currently investigating alternative demand measurement methods to current utilisation. One of the most promising alternative methods is the Schofield and McRae *MedDemandMOD* method. This method uses population characteristics such as age, sex, economic and regional factors to project demand using a nationally comparable data source: the National Health Survey. The proposed method will involve a blended demand method with elements from the *MedDemandMOD* approach and elements from a utilisation rate approach HWA will be seeking expert advice on this approach through the TRG.

- Availability and quality of data

There are significant issues in the present availability and quality of data for projecting demand and supply with consequent issues for the determination of unmet demand. With significant improvements in the availability of data (such as through national registration) the practical aspect of data limitations in determining unmet demand may warrant further investigation. Whilst there are limited specific datasets that have been built in a small number of specialties that would assist in determining unmet demand, there are issues of consistency to be resolved before it would be appropriate to include them in the current modelling.

In terms of identifying unmet demand (or what may be conceived of as unmet need), burden of disease (BoD) data can allude to unmet demand in various populations. In the Australian context, BoD based approaches to health workforce needs are necessarily based on a 9 year old study (AIHW, 2003) and its applicability to current and future levels of disease prevalence is unknown.

Where evidence of existing shortages can be identified and qualified they will be included in the second modeling phase.

- The special case of shortages arising from distributional issues

The Tool begins its projection from the position of supply matching demand. That is, there is no under-or-over supply incorporated into the initial state of the model. The Tool is capable of representing starting year shortages but for the purposes of the initial modelling will start from an assumption of no current shortage at a national level. This assumption should not be taken to imply there is not the potential or existence of significant distributional issues (across geographical regions or within particular specialty groups) in existence.

Distributional issues will be explicitly examined in the second phase of the Plan development.

4.4 Supply

The selection of the appropriate methodology is dependent on the type of data that is available, as well as on the nature and scope of the study using the scoping data. The Tool uses a dynamic version of the stocks and flow approach. In a dynamic stocks and flows calculation, the stock of the workforce is not just affected by external inflows and outflows (as it would be in a static stocks and flow approach) but from inflows and outflows to adjacent age cohorts within the 'stock'. For example, where age and gender data are available the inflows and outflows can be adjusted over the projected period by an iterative recalculation of the age/gender mix of the workforce population in each subsequent year and determining inflows and outflows reflecting the proportions of age/gender cohorts. This provides for a more realistic representation of labour dynamics.

Inflows or additions to the workforce

The main sources of inflows or additions to professional workforces are:

- New graduates or completing trainees:

Estimates of the anticipated number of new and completing graduates is based on information obtained from relevant universities, colleges and training institutions, including recent trends in the number of graduating students and information on the number of trainees currently in the system and their expected years of completion.

- Net in-migration:

For nursing, midwifery and medical professions, data on migratory inflows will be relatively accessible allowing realistic estimates to be produced for this parameter.

- Re-entrants to the workforce:

(Professionals who may have re-commenced employment in the workforce after a period of absence).

This data may be difficult to obtain, with administrative data sets such as payroll typically not recording reasons for new commencements. The national registration data may provide both an indication of the size of the working and non-working pool and the number of re-entrants on a yearly basis but this will require further investigation regarding data quality.

Outflow or losses from the workforce

Outflows or Losses from the workforce primarily include:

- Permanent departures i.e. retirements, resignations, deaths and out-migration.

Registration board or labour force survey data will prove useful in identifying the demographic profile of a workforce, particularly ageing in a profession. Estimated outflows due to retirement may be derived from the same data sets.

- Semi-permanent departures.

These are defined as absences from a workforce on a temporary but medium to long-term basis and include leave-without-pay and maternity leave.

The sum of all permanent and semi-permanent departures during the base year, by age and gender distribution, is the primary input to the supply-forecasting model. This can be expressed as a per cent or share of the total workforce during the base year (the attrition rate). Subsequent projections may include modifications to the input such as a changing incidence of retirement if the data indicates that a higher proportion of outflow is likely in future years.

Where longitudinal data is available, the rate of change (growth rate) in departures will be used in the projection of future outflows. As an illustration, if trend data indicates that semi-permanent departures have been decreasing at a rate of 2% over a five-year period, this rate can be applied to estimate future losses due to semi-permanent movements. If trend data is not available, the simplest assumption is for outflows to be held constant over the forecast period, that is, reflect the attrition rate identified for the base year. The Tool will allow for this assumption to be modified for the purposes of running alternative scenarios and sensitivity analysis on a per jurisdiction or per specialty basis.

Medical and Nursing & Midwifery Specialties

The collection of specialty registration data through AHPRA provides the opportunity to accurately measure the distribution of the medical workforce across specialty and perform projections on the future supply and demand of those specialties.

The Plan uses specialties and sub-specialties as defined by AHPRA for medical practitioners¹. The specialties and sub-specialties are organised in a hierarchical manner, with sub-specialty rolling up into specialty. Where a specialty or sub-specialty has 500 or more current practitioners at a national level we

¹ Located at the following web address (29th April 2011)

<http://www.medicalboard.gov.au/documents/default.aspx?record=WD10%2f106&dbid=AP&chksum=07LyDUkqYq5O5LXuqbSzg%3d%3d>

consider it to have sufficient volume for modelling. For robust results, Tool outputs at the level of age and jurisdiction by specialty require a high number of national practitioners in that field. Sub-specialties with less than 500 are rolled up into their higher specialty level. The list of specialties used at this stage can be found in appendix A.

The medical specialist numbers will be calculated using AIHW 2009 medical labour force based on primary specialty and mapped to AHPRA specialties.

The nursing and midwifery areas are based on 'principal area' categories used in the AHPRA workforce survey. These areas are self reported and consequently may be subject to differing interpretations between respondents. Without common definitions of areas of nursing or alternative methods of arriving at accurate head counts, we are using the AIHW 2009 nursing labour force survey data to arrive at a count of nurses by 'principal area'. The list of nursing areas can be found in appendix A.

As the workforce is generated from AIHW 2009 labour force survey data for the medical, nursing & midwifery workforce, HWA will map AHPRA specialty categories and areas over AIHW categories and areas to smooth the transition from AIHW to AHPRA health workforce taxonomies.

4.5 Sensitivity analysis

Model assumptions

The selection of the appropriate model is determined primarily by:

- data availability, reliability and coverage; and
- the size and complexity of the study workforce and services provided.

In using either the population ratio or the service demand method, there is an implicit assumption that there is a constant relationship over time between service and workload.

In practice there are likely to be factors that will cause this relationship to change over time. Factors such as workforce productivity improvements, new systems of service delivery, and introduction of new technologies may increase the number of services that a workforce can deliver over a given time period. In some instances, the appropriate strategy to address a workforce shortage may well be to seek to change the workload capacity measure by improving productivity.

Conversely, new systems of service delivery (e.g. extending service to remote areas thereby increasing staff travel times), new technologies, or increases in case complexity may decrease the number of services that a workforce can deliver.

For the purposes of the interim report baseline, the implicit assumption of a constant relationship over time between service and workload will be allowed to hold. Parameter adjustments in scenario analysis will allow for this assumption to be loosened in agreed scenarios pending stakeholder input.

Approach to sensitivity analysis

Sensitivity analysis assists in making transparent the underlying dynamics of the modelling and enhancing the quality of the output obtained. There are numerous methods, by which sensitivity analysis in modelling can be undertaken, with some methods more appropriate for particular purposes and model types than others. For the purposes of the Tool quality assurance, a local method sensitivity analysis will be undertaken on the basis of finding the simple derivative of overall labour requirements relative to a range of the input factors.

The interim report will provide the simple derivative (i.e. the elasticity of supply and/or demand response as appropriate) for a common change in magnitude of the following input factors:

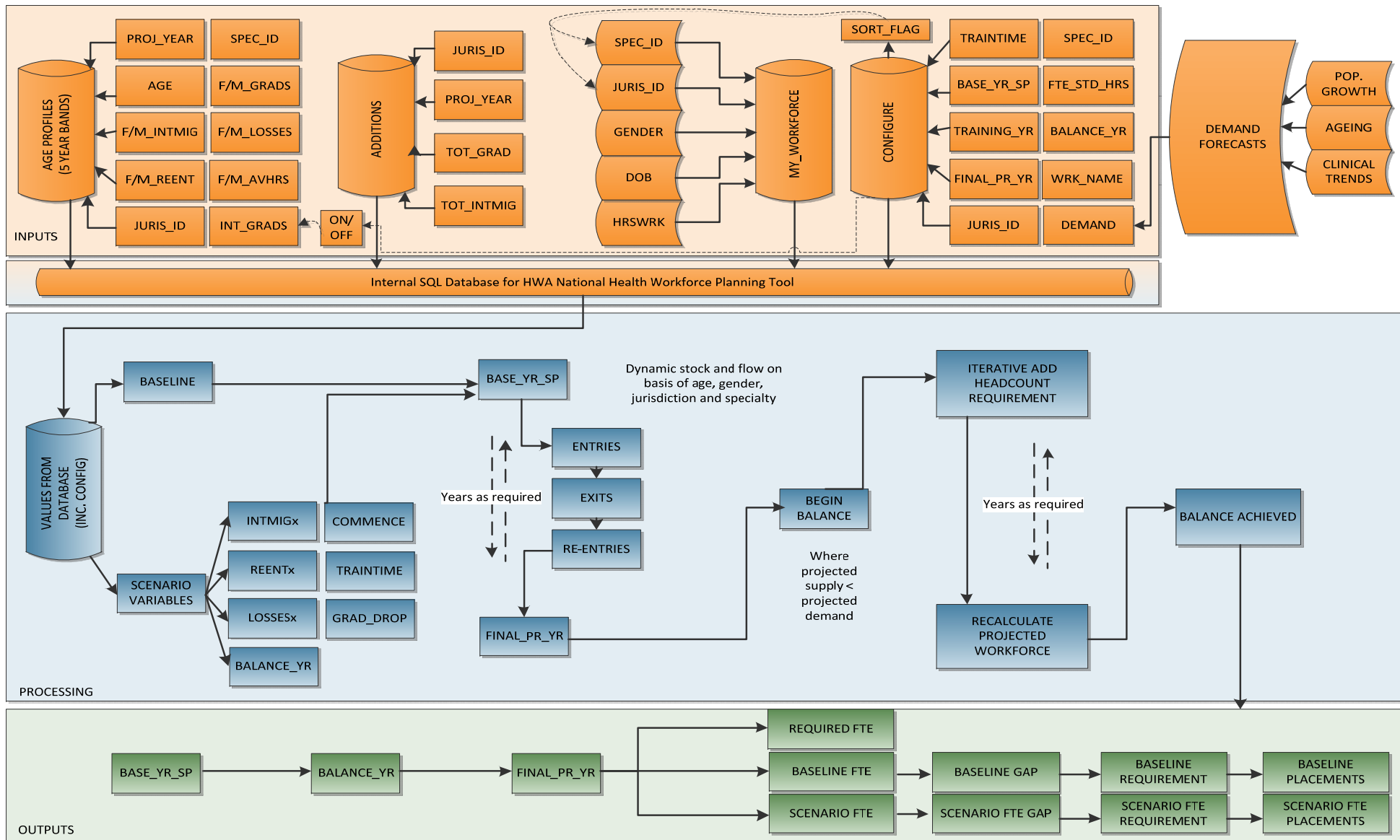
- Exit rates
- Entry rates
- Re-entry rates
- Other inputs identified as requiring sensitivity analysis

The sensitivity analysis will be presented in a form that identifies and provides for the comparison of the relative magnitude of impact of a change. Where possible separate sensitivity analysis will be conducted for each area of specialisation.

4.6 Diagrammatic representation of the model inputs and data flows

The image below is a diagrammatic representation of HWAs National Health Workforce Planning Tool. Data inputs are identified in orange and detail on each of the input data sets is contained in Appendix B. The blue section shows the processing that occurs in the Tool, further explained in section 4.2 of this paper. Outputs produced by the model, as detailed in section 5, are shown in green.

Diagrammatic representation of HWA National Health Workforce Planning Tool



4.7 Model inputs and data flows

Data Inputs

The input section of the tool is completed in a excel spreadsheet and has four tabs these are:

- 5_year_age_profile (from which 1 year age profiles are derived)
- Additions
- My_Workforce
- Configure

SUPPLY

Summary

The first section of the tool to be populated is the baseline year (2009) workforce which is headcount numbers and characteristics of the medical, nursing and midwifery workforce by specialty, jurisdiction, gender, age, and hours worked, (see Appendix B for a list of specialties).

Model modules

My_Workforce

- Specialty
- Jurisdiction
- Gender
- Date of birth
- Hours worked per week

Data source(s)

AIHW 2009 labour force survey data will provide the initial headcount of medical, nursing and midwifery health professionals and their gender, age, jurisdiction, hours worked and specialty (where sufficient national volume).

Specialties will be modeling where there is sufficient national volume for meaningful results. The number of practitioners required for a specialty to be modeled is 500 or more. This is to ensure that when the results are produced for particular jurisdictions and time periods, the estimates are not unduly affected by small numbers of outliers.

Model flow

A 'person' enters into the simulation at year 2009 through a workforce data table. Table 2 shows a medical professional unit record

Table 2 – My workforce tab

Specialty	jurisdiction	gender	DOB	hours_worked
PAEDIATRICIAN	NSW	F	01/01/1984	38.79

Assumptions

As this person progresses through model cycles, they are aged and their hours worked are replaced with the current average for that specialty, gender, jurisdiction and age. The tool also allows for changes to be made in each year for hours worked, this will not be done in the baseline projections as data is not available but will be a scenario that will be run with both hours increasing and decreasing. All other variables are held constant meaning the model is insensitive to an individual's change in jurisdiction, specialty, or in average working hours.

SUPPLY – Additions

Summary

Total number of graduates into workforce in each year. International Migration is the number entering the Australian workforce on a yearly bases, Interstate_Inward_Migration are the numbers on total movements, in the national baseline projections this will be set to zero but will be populate during the jurisdictional projections if data is available. Each graduate will be incorporated into the health workforce stock by their age and will pick up in the current workforce stock by age and will be allocated the characteristics of that profile, graduates will not be allocated into the specialty workforce.

The number of workforce entries from Non-Australian tertiary institutions, primarily through immigration pathways, though not exclusively. Each migrant will be incorporated into the health workforce stock with age, gender, hours worked and specialty attributes.

Model modules

Additions

- Graduates
- International Migration
- Interstate Inward Migration

Table 3 – Additions tab

Year	graduates	Internationl_Migration	Interstate_Inward_Migration
2010	2200	1500	50
2011	2300	1550	55
2012	2350	1500	60

Data source(s) - Graduates

Medical graduates will be determined through Medical Deans data. Medical Dean's data provides age and gender of for each study year medical undergraduates across all universities offering medical degrees.

Nursing (Registered and Enrolled) and midwives graduates are determined through DEEWR and NCVER data. Age and gender will also be provided. This data does not record continuing students by year level. To generate the pipeline number of graduates to enter into the workforce each year of the projection we take the continuing students in the course and divide by the course length minus 1 for commencing students to produce an estimate of annual graduations.

Data source(s) – International Migration

For Medicine, migrant inflows are determined through Australian Medical Council (AMC) accreditation data for age, gender, jurisdiction, and specialty.

Nursing (Registered) and midwifery migrants will be determined Australian Nurse and Midwifery Accreditation Council (ANMAC) data for age, gender, and jurisdiction. Enrolled nursing will be determined using settler data from the Department of Immigration and Citizenship (DIAC), for age, gender, and jurisdiction

Once the additions tab is completed the profile of these numbers need to be completed this is done in the 5_year_age_profile tab

Model flow

Graduates

Each year in the model graduates are entered into the workforce in their respective age, gender, and jurisdiction. We apportion the graduates to jurisdiction in the same proportions as the initial workforce outside

the model. These values are accessed by the model through the my_workforce. (i.e. the database of inputs to the model). The graduate numbers inherit their working hours from the average for matching age, gender, jurisdiction variables stored in the my_workforce tab.

The 5_year_age_profile tab allows us to define the graduate entrants for each year of the simulation and by age, gender, and jurisdiction. Refer to table 4 for a relevant tab example.

Table 4 – 5_year_age_profile tab – Domestic & International Graduates.

jurisdiction	Year	Age	Domestic female graduates	Domestic male graduates	International female graduates	International male graduates
WA	2010	25	50	100	75	75
WA	2010	30	125	150	50	100
WA	2010	35	265	200	100	50
WA	2010	40	300	265	50	25

Assumptions

The Tool allows for fine tuning of graduate entry characteristics throughout the projection range, we will be able to pipeline the graduate numbers based on current enrolments, for medical we will pipeline graduate numbers until 2017, nurses and midwives till 2015 once pipelining is completed we will hold the final numbers constant with, gender, age, and jurisdiction ratios being held constant.

International_Migration

Model flow

In the same way as we introduce new graduates into the simulated workforce, we apportion the migrant inflow to jurisdiction and specialty if data is available in the same proportions as the initial workforce and add them to the workforce. These values are accessed by the model through the 5_year_age_profile tab. The migrant entries inherit their working hours from the average for matching age, gender, jurisdiction, and specialty variables.

The 5_year_age_profile tab allows us to define the migrant entrants for each year of the simulation and by age, gender and jurisdiction. Refer to table 5 for the relevant 5_year_age_profile tab example.

Table 5 – 5_year_age_profile Tab – International Migrants

specialty	jurisdiction	Year	Age	Female international migrants	Male international migrants
Medical	QLD	2010	30	0	0
Medical	QLD	2010	35	0	0
Medical	QLD	2010	40	10	25
Medical	QLD	2010	45	20	30
Medical	QLD	2010	50	25	50
Medical	QLD	2010	55	25	45

Assumptions

While the Tool allows for fine tuning of migrant entry characteristics throughout the projection range, we are holding specialty, gender, age, and jurisdiction ratios constant in the initial stages of trialing the Tool. In this way the output is insensitive to changes in these variables that may occur over time, e.g. migration rates.

Australian citizens who train overseas and enter the workforce through accreditation pathways are included in the inflow vector. Within the Tool these people are indistinguishable from international migrants and any calculation made on the output to infer migrant proportions of the workforce will be overstated to some degree.

SUPPLY – Entries – Re-entries

Model modules

- Re-entries

Summary

The numbers re-entering the workforce from maternity leave, emigration, job shifting away from a given health workforce profession.

The re-entries will be calculated as net effect of residual movement (once graduates and immigration is accounted for) either in or out of the workforce by age, gender, and specialty according recent trends and simulated in the model.

This is calculated by tracking the size of one-year cohorts by specialty and gender across AIHW labour force surveys and adjusting for graduate and migrant inflows

Model flow

We apportion the migrant inflow to jurisdiction and specialty in the same proportions as the initial workforce outside the model. These values are accessed by the model through the 5 year_age_profile tab. The graduates inherit their working hours from the average for matching age, gender, jurisdiction, and specialty variables.

The 5 year_age_profile tab allows us to define the graduate entrants for each year of the simulation and by age, gender, jurisdiction, and specialty. Refer to table 6 for 5 year_age_profile tab example.

Table 6 – 5 year_age_profile tab – Re-entries.

Specialty	jurisdiction	Year	Age	Female re-entries per cent	Male re-entries per cent
Medical	VIC	2008	20	0.02	0.01
Medical	VIC	2008	25	0.02	0.01
Medical	VIC	2008	30	0.02	0.01
Medical	VIC	2008	35	0.02	0.01
Medical	VIC	2008	40	0.02	0.01
Medical	VIC	2008	45	0.02	0.01

Assumptions

The model assumes a constant rate of entry by age, gender, specialty and jurisdiction over the projection range of the model. This may not reflect any underlying trends occurring over the same time period.

This is an area where data collection can be greatly improved. The model allows us apply re-entry rates at a very specific level. The data, however, is lacking the degree of specificity (e.g. distinguishing a return from maternity leave from a return after working overseas) to fully apply re-entry rates specific to particular professions with demographic sensitivity.

SUPPLY – Exits

Model modules

- Losses

Summary

The number exiting the workforce through maternity leave, emigration, job shifting, retirement, or mortality/morbidity.

The exits will be calculated as net effect of residual movement (once graduates and immigration is accounted for) either in or out of the workforce by age, gender, and specialty according recent trends and simulated in the model.

This is calculated by tracking the size of one-year cohorts by specialty and gender across AIHW labour force surveys and adjusting for graduate and migrant inflows.

Model flow

We apportion the exits to jurisdiction and specialty in the same proportions as the initial workforce outside the model. These values are accessed by the model through the 5 year_age_profile tab.

The 5 year_age_profile tab allows us to define the exits for each year of the simulation and by age, gender, jurisdiction, and specialty. Refer to table 7 below for a 5 year_age_profile tab example

Table 7 – 5 year_age_profile Tab – Exits.

Specialty	jurisdiction	Year	Age	Female exits per cent	Male exits per cent
PAEDIATRICIAN	NSW	2010	50	0.02	0.01
PAEDIATRICIAN	NSW	2010	55	0.02	0.01
PAEDIATRICIAN	NSW	2010	60	0.02	0.01
PAEDIATRICIAN	NSW	2010	65	0.02	0.01
PAEDIATRICIAN	NSW	2010	70	0.02	0.01
PAEDIATRICIAN	NSW	2010	75	0.02	0.01

Assumptions

Exits share the same assumptions as re-entries. The model assumes a constant rate of exits by age, gender, specialty and jurisdiction over the projection range of the model. This may not reflect any underlying trends occurring over the same time period. This is also an area that can be greatly improved in data collection where a breakdown of reasons for exiting would allow for more specific application of exit rates to the workforce

CONFIGURATION TAB

Summary

This is the configuration section which set the parameters for the model to run, each of the workforce name sections pick up the character tics input in the my workforce tab, this then adds the additions and final subtract the exits in the 5_year_age _profile tab, which allows us to control additional variables in the Tool (and thus generate scenarios) through the configuration file.

Table 8 – Configuration tab

workforce name	jurisdiction	specialty	base year supply	standard working hours	initial training year scenario	training time scenario	balancing year scenario	my demand
Doctors	VIC	endocrinology	2010	40	2011	0	2025	0.03
Registered Nurse	WA	acute	2010	38	2014	3	2025	0.03
Enrolled Nurse	NSW	aged care	2010	38	2013	2	2025	0.03
Doctors	VIC	surgeons	2010	40	2011	0	2025	0.03
Midwives	NSW		2010	38	2014	3	2025	0.03
Doctors	VIC	non-specialist	2010	40	2017	5	2025	0.03

The configuration tab allows us to set the values for standard working hours, training time, range of the projection (base year and balancing year) and demand growth by workforce, jurisdiction and specialty. Below is a table outlining how the variable interacts with the workforce projection.

Table 9 – Configuration parameters

Configuration file parameter	Purpose of variable
workforce name	Defines the workforce to which the parameters are applied
jurisdiction	Defines the jurisdiction to which the parameters are applied
specialty	Defines the specialties to which the parameters are applied
base year supply	Defines the starting year of the projection
standard working hours	Used to calculate head count by dividing total hours worked for a given workforce by this value.
initial training year scenario	Defines the first year when modelled graduates enter their course.
training time scenario	Defines the time required to train a student
balancing year scenario	Defines the target year for balancing and the final year of the projection
my demand	Defines the rate of demand growth applied to the each year in the projection as a percentage of the starting year's total hours worked

The parameters in the configuration tab provide the opportunity to run alternative scenarios based on alternative standard working hours, levels of growth in demand, training time, and the time with which the system has to achieve a balancing of supply and demand; and do so at a workforce-jurisdiction-specialty level.

5 Analysing the findings

5.1 Baseline analysis

The modelling to be undertaken will allow for a:

- Comparison of projected supply and demand; and
- A subsequent identification of the gap between supply and demand at the commencement, during and at the end of the projection period.

In order to make such a comparison, the final output units of measure from the workforce supply and demand analysis must be the same. As stated previously, we will model in such a way that headcounts are initially generated before being translated into FTEs as per the method provided in this paper. The chart and table below graphically represent this comparison.

Chart A – Graphic representation of a supply/demand gap

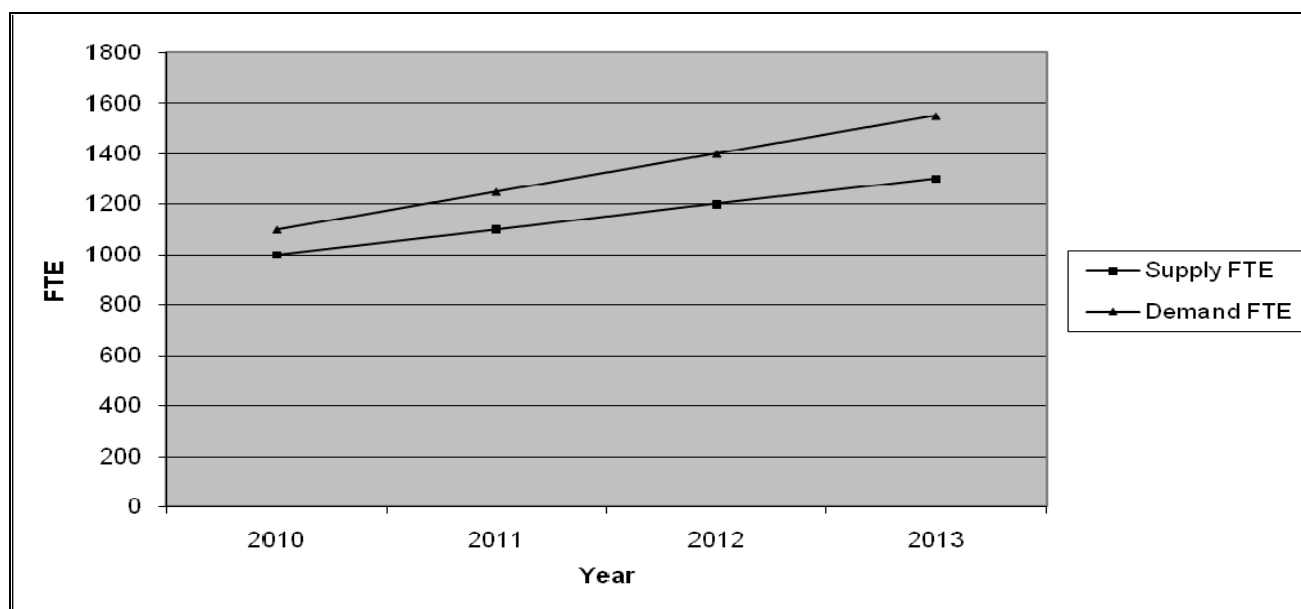


Table 10 – Tabular representation of a supply/demand gap

Year	2010	2011	2012	2013
Supply FTE	1000	1100	1200	1300
Demand FTE	1100	1250	1400	1550
Shortfall / Surplus	-100	-150	-200	-250

In this instance the comparison indicates a shortfall which is widening over the projection period. Gap analysis also allows the estimated supply and demand trends over the projection period to be compared. The expected relationship or pattern between supply and demand on the basis of the modelling assumptions will also be compared i.e. whether the study workforce is expected to converge, diverge, and remain in constant proportion. This gap analysis (which will be undertaken on a per workforce basis as well as on a specialty and jurisdictional basis) will form a major input into the interim report. The gap analysis will form a major input to the strategy development stage. How the gap will be lessened is at the essence of the strategy development stage, and scenario modelling is one way of informing this process.

Areas that can be adjusted to are:

- adjust education and training intake;
- adjust workforce losses (by promoting retention, delaying retirement etc.);
- encourage workforce re-entry (for shortages) or early exit (for surpluses);
- adjust net migration;
- improve workforce productivity;
- improve workforce distribution (which could be in either the geographic or the structural sense);
- redesign workforce tasks to vary the combination of skill mix and professions

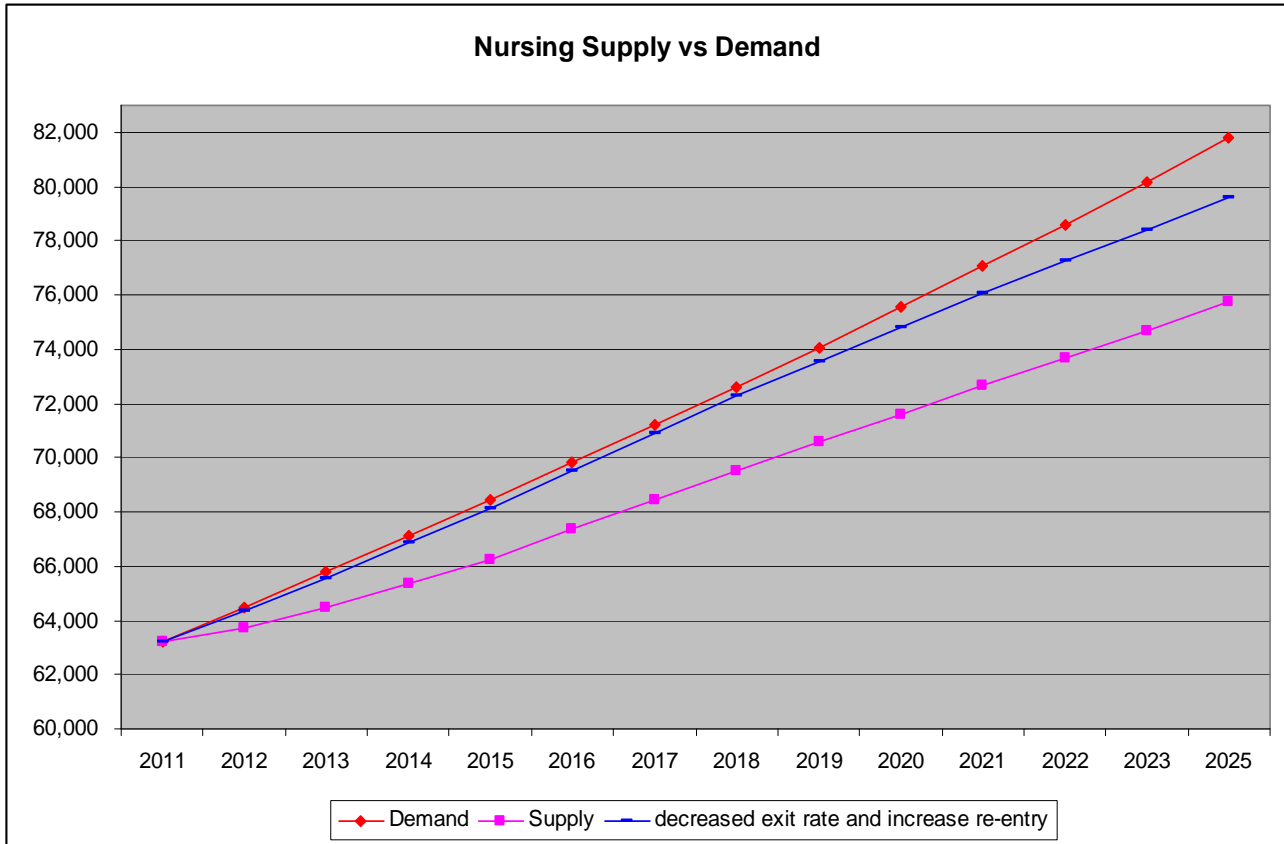
5.2 Alternative Scenarios

This section provides an illustration of how alternative scenarios can be developed. In this case the parameters to be varied are the exit and re-entry rates for nurses. The objective is to vary the exit rates and observe the effect on the gap between supply and demand. In the example below exit rates have been changed from 2.4% to 1.9%, while the re-entry rate has changed from zero to 0.1%. These changes reflect increased returns to the workforce (e.g., returning from maternity leave) and increased workforce retention. The impact of this scenario over status quo projections can be seen in 2025 where greater workforce re-entry and retention rates reduce the shortfall of workforce numbers by 3832 and can be seen on chart 2. Scenarios will be developed and modelled during the consultation phase with stakeholders at the June workshops.

Table 11 – Example of scenario modelling

Current Projection (Status quo)														
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2025
Demand	63,224	64,488	65,778	67,094	68,436	69,804	71,200	72,625	74,077	75,559	77,070	78,611	80,183	81,787
Supply	63,224	63,749	64,460	65,370	66,254	67,356	68,436	69,502	70,556	71,602	72,643	73,680	74,713	75,740
Student Intake	1,515	1,365	1,514	1,727	1,727	1,971	1,971	1,971	1,971	1,971	1,971	1,971	1,971	1,971
Exits	1,732	1,732	1,672	1,682	1,714	1,748	1,781	1,809	1,833	1,853	1,870	1,886	1,902	1,919
Re-entry	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Migration	892	892	918	945	974	1,001	1,031	1,058	1,084	1,109	1,132	1,153	1,173	1,191
Scenario projection (increased returns into workforce and retention of workforce)														
Balance	0	-740	-1,318	-1,724	-2,182	-2,449	-2,764	-3,123	-3,521	-3,957	-4,427	-4,931	-5,471	-6,047
Scenario														
Demand	63,224	64,488	65,778	67,094	68,436	69,804	71,200	72,625	74,077	75,559	77,070	78,611	80,183	81,787
Supply	63,224	64,339	65,522	66,844	68,099	69,537	70,922	72,259	73,556	74,816	76,045	77,245	78,420	79,572
Student Intake	1,515	1,365	1,514	1,727	1,727	1,971	1,971	1,971	1,971	1,971	1,971	1,971	1,971	1,971
Exits	1,232	1,232	1,291	1,351	1,409	1,461	1,508	1,549	1,585	1,616	1,644	1,669	1,693	1,716
Re-entry	90	90	92	93	94	95	96	96	97	98	99	99	101	102
Migration	892	892	918	945	974	1,001	1,031	1,058	1,084	1,109	1,132	1,153	1,173	1,191
Balance	0	-150	-256	-250	-336	-267	-279	-365	-521	-742	-1,025	-1,366	-1,763	-2,215
Difference	0	590	1062	1474	1846	2182	2485	2758	3000	3215	3402	3565	3708	3832

Chart 2 – Projections of workforce demand and supply



Appendix A - Medical and Nursing Specialities

Table 12 – list of medical specialties with sufficient volume for individual workforce modelling based on the APHRA classification of medical specialties

Specialty	Specialty Field
Anaesthesia	
Emergency	
General practice	
Intensive care medicine	
Obstetrics and gynaecology	
Ophthalmology	
Paediatrics and child health	
Pathology	
Psychiatry	
Radiology	
Physician	All (17 specialty fields)
	Cardiology
	Gastroenterology
	General medicine
Surgery	All (11 specialty fields)
	Orthopaedic surgery
	General surgery

Note: Specialties require more than 500 practitioners nationally for modelling.

Nursing areas as defined by the principle area categories, in AHPRA nursing survey forms.

- Registered Nurses
 - Enrolled Nurses
- by
- Acute
 - Critical care, High dependency and Emergency
 - Mental Health
 - Aged Care
- AND
- Midwives

Appendix B – Supply and demand data sources

Essential workforce supply data items

The following workforce supply data items will be gathered:

- number of employees (full time employment (FTE) and head count)
- hours worked
- permanent & semi-permanent departures (retirements/deaths/leave without pay/maternity leave)
- entrant levels (graduates/migration/re-entry)
- geographic location
- non-participating practitioners/professionals

Characteristics

- age/year of birth
- gender
- country of birth, background
- length of service in profession
- exit rates
- postcode (work)
- job type
- occupation/profession
- service type

Education & training

- total number of new graduates per course
- number of graduates who enter the workforce annually
- student numbers per course (and course identification)
- number of graduates who don't enter profession/workforce annually
- capacity of education and training system (including infrastructure and supervisory capacity)

Other

- number of migration applications approved (permanent/temporary) by occupation
- number of new migrant entrants to workgroup annually.

Supply data sources used in the NTP

The primary source for supply data for the initial baseline will be the Australian Institute of Health and Welfare (AIHW) 2009 labour force survey data, HWA has been assessing the 2010 Australian Health Practitioners Registration Agency (AHPRA) data and have found that the current data requires considerable cleansing and data checks being completed prior to being used. The overall aim will be that cleansing will be conducted during June 2011 for Medical and will commence in August 2011 for Nursing and Midwifery and be concluded by October 2011. The cleansed data will then be incorporated into the baseline model prior to the final report being completed.

AIHW data will provide headcount, specialty, FTE, and geographical workforce composition data.

AIHW workforce data will be complimented with data from Department of Immigration and Citizenship (DIAC) and Australian Medical Council (AMC) for workforce immigration estimates. Department of Employment, Education and Workplace Relations (DEEWR) data will be the primarily source for registered nurses and midwifery graduates, enrolled nurses data will be ascertained from The National Centre for Vocational Education Research (NCVER). For medical graduates, Medical Deans data will be used for graduate inflows.

A process of quality assurance to ensure the most consistent and accurate datasets are used in the modelling has been undertaken. Table 1 below indicates the datasets and sources that will be used in the NTP.

Table 13 – Supply data items

Supply data sources and datasets	Application of Data	Data Limitations	Data/Methodology Assumptions	Datasets
AIHW	AIHW labour force data will be used for baseline numbers and historical workforce data. Survey data will also be used to model exits and re-entries	As with any large, self-reporting survey, there are issues of data quality. Respondents do not answer every question and can interpret each question differently.	Generally accepted conventions have been applied. These include the exclusion of data which is obviously in error (for example, individual who claims to be > 100 years old or working 200 hours per week) and the apportionment of non-responses in proportion to valid responses.	AIHW labour force surveys data
DEEWR	A primary source for Registered Nurses, Midwifery enrolments and secondary source for medical student enrolments to model the graduate entry pipeline	Data does not distinguish between study year	Entries into the workforce are measured as total students divided by length of course in years. Individual courses and University will be modelled to generate graduate pipeline	DEEWR student data for nurses and midwives workforce entrants.
Medical Deans	The primary source for medical student enrolments to model the graduate entry pipeline	A highly reliable data source.	Individual courses and Universities will be modelled to generate graduate pipeline	Medical Deans dataset
Australian Medical Council (AMC)	The primary source for immigration medical practitioner data to measure model entries	A highly reliable data source	Model assumes constant level of entry in the future	AMC accreditation pathway datasets
Australian Nursing and Midwifery Accreditation Council (ANMAC)	The primary source for immigration nursing and midwifery data to measure model entries	Unknown availability of data.	Model assumes constant level of entry in the future	ANMAC accreditation pathway datasets
DIAC	Enrolled nursing immigration data	Data may not reflect	Data acts as only a proxy for employment	DIAC immigration and arrivals data

Supply data sources and datasets	Application of Data	Data Limitations	Data/Methodology Assumptions	Datasets
NCVER	Compile dataset of Enrolled Nurses, Midwifery students/graduates for graduate pipeline	Data does not distinguish between study year (an issue for accurate pipelining)	Entries into the workforce are measured as total students divided by length of course in years. Individual courses will be modelled to generate graduate pipeline	NCVER student data for nursing/mid-wife workforce entrants.
MTRP	An initial source of medical health training and workforce data compiled from specialist colleges. The final report will contain college sanctioned data)	Assumes data is consistent with college datasets. College admissions vary significantly from year to year.	Dataset with specialty admission by college.

Essential workforce demand data items

The primary data sources for the baseline demand estimates of the nursing, midwifery and medical workforce include the data items listed in the table below. .

The two main methods that will be used for establishing the demand estimates are the:

Hardes forecasting method which used the hospital component (acute and sub-acute) of the nursing, midwifery and medical workforce and include the following data items:

- State/Territory
- Year (including projections)
- Age group
- Gender
- Service Related Group
- Enhanced Service Related Group
- Stay Type (same day, overnight)
- Separations
- Bed-days
- Excess Bed-days (days over 90 days stay)

MedDemandMOD which is a model particularly for demand for general medical practitioner services that capture:

- Demographic factors – age/sex supply of services
- Regional factors – area of remoteness
- Economic factors – socioeconomic indices and health status

Table 14 – Summary Demand data items

Demand Model	Data Source	Application of Data	Data Limitations	Data/Methodology Assumptions	Datasets
All	ABS	ABS population projections	None	Assumes accuracy of population projections, particularly birth rates and life expectancy/cohort transition rate.	ABS Australian population projections – Series B
Baseline	AIHW: Mental Health HAAC community data Non Admitted Patient data Medicare	Hospital Separations data Health care utilisation rates Medicare patient services	The majority of the AR-DRGs have been growing at a faster rate than simply population growth and ageing	Increasing trends in utilisation of these separations has been projected Items refer to ' <i>professional attendance by a medical practitioner in the practice of</i>	Hospital morbidity data cubes Medicare