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The Pharmacy  
Guild of Australia

## Pharmacy Workforce Planning Study

**Researchers:** *Human Capital Alliance (International) Pty Ltd*



**PHARMACY WORKFORCE PLANNING MODEL — explanation & use**

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- the Professional Programs and Services Advisory Committee Research & Development Steering Committee;
- the Pharmacy Guild of Australia;
- the Department of Health and Ageing;
- the Pharmaceutical Society of Australia;
- the Society of Hospital Pharmacists of Australia;
- the Council of Pharmacy Schools: Australia New Zealand Inc;
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- the National Health Workforce Taskforce.

To learn more about this project and to obtain companion publications go to the following websites:

[www.guild.org.au/research](http://www.guild.org.au/research)

[www.humancapitalalliance.com.au](http://www.humancapitalalliance.com.au)

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## Acronyms

Acronym	Explanation
ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
ANZSCO	Australian and New Zealand Standard Classification of Occupations
APC	Australian Pharmacy Council
ASCO	Australian Standard Classification of Occupations
BEACH	Bettering the Evaluation and Care of Health
CPS	Cognitive Pharmacy Services
CPSANZ	Council of Pharmacy Schools: Australia New Zealand Inc
DMAS	Diabetes Medication Assistance Service
HCA	Human Capital Alliance
HCI	Health Care Intelligence
HMR	Home Medicines Review
PAMS	Pharmacy Asthma Management Service
PBS	Pharmaceutical Benefits Scheme
PGA	Pharmacy Guild of Australia
QCPP	Quality Care Pharmacy Program
R&D	Research and Development
RMMRs	Residential Medication Management Reviews
RPBS	Repatriation Pharmaceutical Benefits Scheme
SHPA	Society of Hospital Pharmacists Australia

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## Chapter 1: Introduction

### Background to project

A two year project to research the pharmacy workforce commenced in December 2007. The research was funded from the Research and Development (R&D) Program of the Fourth Community Pharmacy Agreement and conducted under the guidance of an Advisory Panel. For the duration of the project and on numerous occasions the study relied on and appreciated the support of this group.

The project was intended to build upon work undertaken in two previous studies of the pharmacy workforce in 1999 and 2003 that identified current and ongoing workforce shortages (HCI 1999, HCI 2003).

The importance of pharmacy workforce planning in Australia cannot be understated. There are many factors which have contributed to the complexity of workforce planning over recent years. These issues include:

- the opening of new pharmacy schools and the expansion of existing pharmacy schools;
- shortages of pharmacists, particularly in rural and remote areas; and
- the desire for profession-wide uptake of cognitive pharmaceutical services.

Getting an appropriate balance between workforce supply and demand is not an academic issue. *Excess demand* over supply can lead to shortages which can become a risk to public health and result in compromised patient safety, the inability of the pharmacy profession to meet patient medication management needs, and damage to the professional image of pharmacy (Desselle, 2006). *Excess supply* over demand can be a drain on the public purse if training is subsidised by the public. It can also result in the lowering of salaries and conditions for personnel who are employees. As salaries drop, the quality of people entering the profession can also decline. Eventually this would lead to a decline in the image of the profession in the public eye.

### Project objectives

Most workforce planning projects aim to deliver robust predictions of the future state of supply and demand labour balance, and the previous research efforts in this area (HCI 1999, HCI 2003) certainly had this objective. This aim is generally pursued in spite of the record of workforce planning of rarely accurately predicting workforce supply or demand much beyond the medium term (5 years). Moreover, these questionable predictions are invariably accepted with an almost deterministic resolve, despite the obvious opportunity to influence future outcomes (and thereby change the forecast).

The objectives for this project were to achieve more dynamic outcomes. The specific final 'product' from the project is an interactive Pharmacy Workforce Planning Model (referred to throughout the rest of this document as 'the model') with accompanying discussion of (1) how the model can be used to understand and explore the dynamics of the pharmacy workforce and (2) some results [possible scenarios] of the application of the model. The specific purposes of the project [at project commencement] with a brief summary of achievement against each purpose are outlined in the Table below.

**Table 1: Project objectives and achievements**

study purposes	achievement summary
<ul style="list-style-type: none"> <li>▪ validate and where necessary refine the model and projections in the 'Workforce Supply and Demand 2000-2010' report (HCI, 2003);</li> </ul>	<ul style="list-style-type: none"> <li>▪ a new model for projecting supply and demand that is much more flexible and accessible has been developed. This new model departs significantly from the conceptual approach of the previous model especially in the treatment of professional pharmacy services.</li> </ul>
<ul style="list-style-type: none"> <li>▪ develop a 'forecast' of annual supply and demand for pharmacy workforce using an optimal model through to 2025;</li> </ul>	<ul style="list-style-type: none"> <li>▪ a forecast of 'Best estimate' for supply and demand to the year 2025 has been constructed as well as two other possible scenarios (a 'Left behind' World and an 'Aspirational' World). Many other scenarios are easily able to be tested.</li> </ul>
<ul style="list-style-type: none"> <li>▪ provide information about the current state of the pharmacy workforce;</li> </ul>	<ul style="list-style-type: none"> <li>▪ the current pharmacy workforce supply and demand is fully described.</li> </ul>
<ul style="list-style-type: none"> <li>▪ identify, analyse and quantify factors, including</li> </ul>	<ul style="list-style-type: none"> <li>▪ a total of 35 variables influencing future supply of</li> </ul>

practice change initiatives that either are or have the potential to affect the pharmacy workforce;	and demand for pharmacists are described including the likely way these variables will affect the pharmacy workforce.
<ul style="list-style-type: none"> <li>▪ identify opportunities for innovative intra and inter profession arrangements that lead to pharmacy workforce retention and capacity building;</li> </ul>	<ul style="list-style-type: none"> <li>▪ in discussions of various pharmacist labour market scenarios generated from the model issues of job satisfaction and workforce retention are covered in a general sense. Micro level addressing of professional arrangements is not substantial.</li> </ul>
<ul style="list-style-type: none"> <li>▪ identify and consider issues to be addressed relating to balancing pharmacy workforce supply and demand;</li> </ul>	<ul style="list-style-type: none"> <li>▪ A range of policy and practice responses to at least three significantly different labour market scenarios are discussed with a view to achieving a balance between workforce supply and demand.</li> </ul>

The model facilitates experimentation with different policy, practice, administrative and economic possibilities and allows analysis of impact on the pharmacy labour market. The underlying philosophy then is that strategic workforce planning can never provide a precise view of the future, but it can provide an understanding of the issues and a platform to develop policies to reduce future risk.

## Context of this report

During the course of the two years of the project a number of separate but related studies were undertaken to build an understanding of pharmacy workforce supply and demand variables (for instance an analysis of available secondary data, a study of a number of hospital and community pharmacy cases, a search conference). Each of these studies generated a separate report including a description of the process and findings, some of which were published on Human Capital Alliance's website. The reports published were generally those that could stand alone and in which the information was not likely to be superseded by subsequent investigations and reports, for instance the literature review and the initial descriptions of pharmacy workforce supply. In the early stages of the project a report describing the factors influencing demand was not published because of its highly speculative nature and the limitations of the data source; more recent reports (including this one) detail the demand variables much more successfully.

Further information concerning these reports is provided at Appendix A with a website address identifying those that were published. An overview of the project methodology is provided in Appendix B which allows the reader to understand what parts of the methodology was directly described in a separate report. Method components in Appendix B marked with an (\*) were those that were covered by a separate report. Each of the components of the methodology and the reports generated contributed directly to either the construction of the model or the final reports (or both).

This 'Final Report' (*Pharmacy Workforce Planning Model — Explanation & Use*) sits within a suite of related publications including:

- An Abstract;
- Key Findings;
- Executive Summary; and
- A Full Final Report.

The most complete understanding of the project activities and findings can be gained from the Full Final Report.

## Definitions

An initial challenge to enumerating and describing both supply of and the demand for the pharmacy workforce is a determination of the boundaries of the workforce. Who is to be counted and described, and who is not?

A simple approach might be to count any person in the workforce associated with the delivery of pharmacy services. This would include anyone working in a community pharmacy, anyone working in a hospital pharmacy, and anyone working in the pharmaceutical industry supporting pharmacy services (at least for which registration as a pharmacist is required). In addition to this population, there is a growing group of qualified pharmacists who work in several settings providing professional services such as medication reviews in health care institutions or peoples' homes. These are often called 'consultant pharmacists' and must be included in any enumeration. People working

in academia in schools of pharmacy, and those in the pharmaceutical industry, especially those with a pharmacy qualification, must also be included. Those people with pharmacy qualifications who might work in public policy making or public administration and whose work is largely focused on supporting the delivery of pharmacy services (e.g. government health policy in pharmaceutical use, drug information and support of quality use of medicine efforts including with the National Prescribing Service) might also be considered in the workforce.

Ultimately the decisions around boundaries are determined by (and subsequently defended on the basis of) definitions determined by those who collect and make available data. Hence, for the purposes of this project, the pharmacy workforce boundary has been determined by the Australian Bureau of Statistics and the definitions they have developed within the Australian and New Zealand Standard Classification of Occupations (ANZSCO). This classification framework includes persons identified as hospital pharmacists (ANZSCO 2515-11), industrial pharmacists (ANZSCO 2515-13) and retail pharmacists (ANZSCO 2515-15), as well as pharmacy technicians (ANZSCO - 311215) and pharmacy sales assistants (ANZSCO - 621411). A definition of all Australian Standard Classification of Occupation (ASCO) and ANZSCO codes used is provided in the initial pharmacy workforce supply report (Ridoutt, Bagnulo and Biason, 2008).

## Chapter 2: Overview of the model

Labour markets are traditionally defined as the processes through which the relationship between supply of and demand for labour is determined. A more dynamic definition of a labour market is where workers find paying work, employers find willing workers, and where wage rates are determined. Indeed, labour markets are much less predictable than is generally understood and the interplay between supply and demand is quite dynamic and complex.

Because of this dynamic relationship most workforce planners agree the real value of workforce planning is to be able to examine and assess a range of possible scenarios and conclude which might be preferable; from professional, social, political and economic perspectives. The model developed through this project provides a hopefully simple and easy to use tool that facilitates such a capacity.

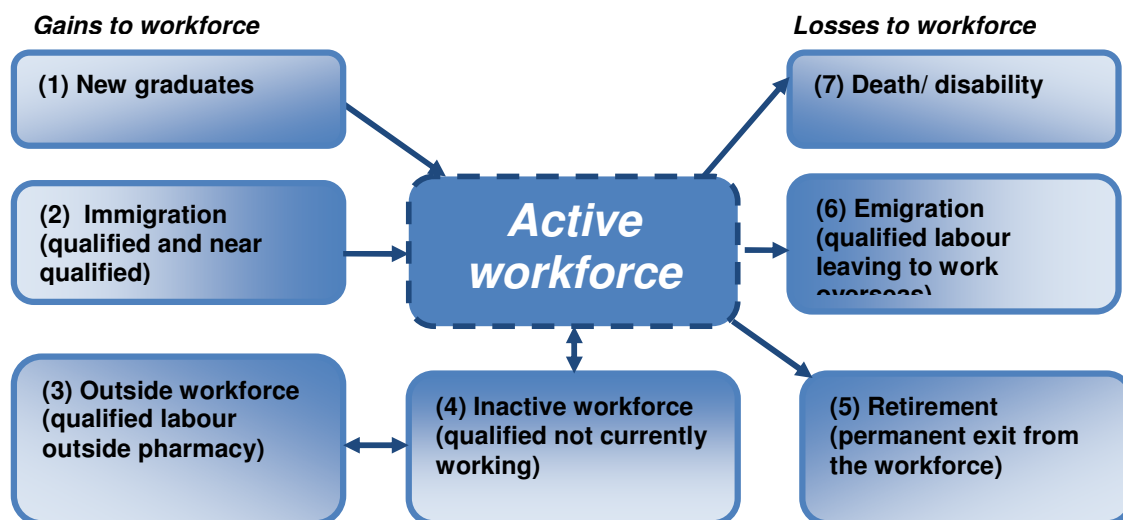
### The process of modelling supply and demand

The model is constructed on standard workforce planning principles and compares current and projected estimates of annual supply and demand over a 20 year time period. The time period commences in 2006 (the base year) as it provided the most recent accurate estimate of workforce size<sup>1</sup>. Supply and demand estimates are modelled independently, although in real life most workforce planners acknowledge that supply and demand interact and influence each other, especially over such a long period of time. For instance, oversupplied labour markets can have an inflationary impact on demand, especially if there is any scope for self induced demand for services.

Supply is modelled using what is termed a 'stock and flow' approach. The key variables that affect any workforce's active size, growth and composition from year to year are outlined in Figure 1 below. Variables to be calculated include both the numbers inside the boxes ('stock') and the value of the arrows which are generally considered as rates of change ('flow'). Hence the approach is called a 'stock and flow' model.

Assumptions adopted for each of the 'flow' components of the supply projection model are expressed as percentages or rates of change, which are multiplied by the active workforce and allow an annual calculation of the losses and gains to the active workforce. This net loss or gain is added onto the next year providing a new estimate of the projected active workforce supply. The same percentages are multiplied by the new active workforce supply estimate and again the resulting net loss or gain is added onto the following year and so on. As such it is a compounding growth rate i.e. growth on growth.

**Figure 1: Pharmacist workforce supply variables framework**



Estimating future demand for the pharmacist workforce is less mechanistic—there is no agreed formula or approach that can be implemented to provide a single answer. Demand for labour is a derived value, dependent upon what it is that the labour will do, that is, what consumers want from their health services. Demand has hence been modelled as much as possible on separate areas of service delivery. Ideally a sufficiently fine level of

disaggregation of service delivery would be adopted to allow modelling of every discrete mode of service delivery (for instance within community pharmacy different forms of service delivery ranging from internet distribution to forward pharmacy service models); practically though the service areas able to be modelled are limited to community pharmacy, hospital pharmacy, medication review in health care institutes and the home, government supported primary health care and other pharmacist services.

There are two major approaches to the estimation of labour requirements — a "demand" or "needs" approach. Hall and Mejia (1978) describe these two approaches as follows:

*"Demand, ... refers to the sum of the amounts of the various types of health services that the population of a given area will seek and has the means to purchase at the prevailing prices within a given time period. From this demand the health manpower required to produce these services can be derived.*

*Need represents estimation based on professional judgment and (available) technology of the number of workers or amount of services necessary to provide an optimum standard of (service). Need exceeds demand when there are insufficient resources to purchase services in accordance with professionally determined needs."*

The modelling approach strongly favours the 'demand' method. In so doing two ways of estimating demand are used;

Economic demand method: an assessment is made of the current and future social, political and economic circumstances, and how consumers of services, service providers and employers of labour will behave as a result of those circumstances. Assessment is focused on such factors as the availability of government funding, the likely level of private sector investment, the type of technology available, the way work is organised and the influence of price<sup>ii</sup> and income.

Service utilisation method: Data on current service utilisation serves as a good measure of satisfied demand. Analysis of past trends in service utilisation allows estimation of the likely future changes in utilisation patterns. This approach is used more to benchmark or validate estimates from an economic demand method.

## Model variables

In all there are 35 independent variables in the model to set and manipulate. These are summarised in Table 2 below.

**Table 2: Independent variables**

supply variables	demand variables
Active workforce (Headcount)	Population growth
Full-time equivalent conversion factor	Fulltime equivalent conversion factor
<u>Gains to the workforce</u> <ul style="list-style-type: none"> <li>▪ new graduate supply                             <ul style="list-style-type: none"> <li>• short</li> <li>• medium</li> <li>• longer term</li> </ul> </li> <li>▪ immigration of Australian trained pharmacists</li> <li>▪ immigration of overseas trained pharmacists</li> <li>▪ gains from inactive workforce</li> </ul>	<u>Community pharmacy services</u> dispensing and related activity <ul style="list-style-type: none"> <li>▪ the sex and age specific ratios of scripts to persons per annum</li> <li>▪ productivity of the dispensing workforce</li> <li>▪ ratio of technicians to community pharmacists</li> <li>▪ technician equivalence to pharmacists</li> </ul> primary health care service activity
	<u>Hospital pharmacy services</u> <ul style="list-style-type: none"> <li>▪ the number of people attending hospitals</li> <li>▪ the ratio of pharmacists to hospital separations</li> <li>▪ unrealized demand</li> </ul>
	<u>Asthma service programs</u> <ul style="list-style-type: none"> <li>▪ proportion of GP encounters</li> </ul>

supply variables	demand variables
	<ul style="list-style-type: none"> <li>▪ time per encounter</li> </ul>
<u>Losses from the workforce</u> <ul style="list-style-type: none"> <li>▪ loss from active workforce</li> <li>▪ loss from retirement                             <ul style="list-style-type: none"> <li>• short</li> <li>• medium</li> <li>• long term</li> </ul> </li> <li>▪ loss from death &amp; disability</li> <li>▪ loss through migration overseas</li> </ul>	<u>Diabetes service programs</u> <ul style="list-style-type: none"> <li>▪ proportion of GP encounters</li> <li>▪ proportion of encounters Diabetes Type 2</li> <li>▪ time per encounter</li> </ul>
	<u>Residential Medication Management Reviews (RMMRs) services</u> <ul style="list-style-type: none"> <li>▪ growth trend</li> <li>▪ patient coverage</li> <li>▪ patient turnover</li> <li>▪ time per review</li> </ul>
	<u>Home Medicine Reviews (HMRs) services</u> <ul style="list-style-type: none"> <li>▪ growth trend</li> <li>▪ time per review</li> </ul>
	<u>Other pharmacy services</u> <ul style="list-style-type: none"> <li>▪ community pharmacy share of total services</li> </ul>

With the large number of variables outlined in Table 2, all of which have at least five value options, the theoretically possible labour market scenarios able to be generated is huge; indeed hundreds of possible permutations. Hence the model has been set up with three saved scenarios which can be activated and the values for each of the above variables is provided for each scenario. The three saved scenarios are:

- *Default scenario*: this is the scenario that is otherwise termed 'Best estimate'. It has values which, based on evidence available at the time of the study, are estimated to be the most likely outcomes to occur. The default scenario is the closest the model comes to providing a forecast;
- *An Aspirational world scenario*: a high demand and high supply growth labour market scenario that assumes much of the desired direction the profession seeks for pharmacy services has begun to bear fruit; and
- *A Left behind World scenario*: this is a scenario that largely assumes the status quo in pharmacy services delivery especially in the community sector producing a low demand growth and an uncertain growth in supply labour market.

In the following Chapter each of the variables included in the model and listed in Table 2 above are described and the default value for each variable nominated. A summary of the values of the 'default' scenario is provided in Table 5 at the end of Chapter 3. The other two scenarios are described in more detail in Chapter 4 and compared at length with the 'default' scenario.

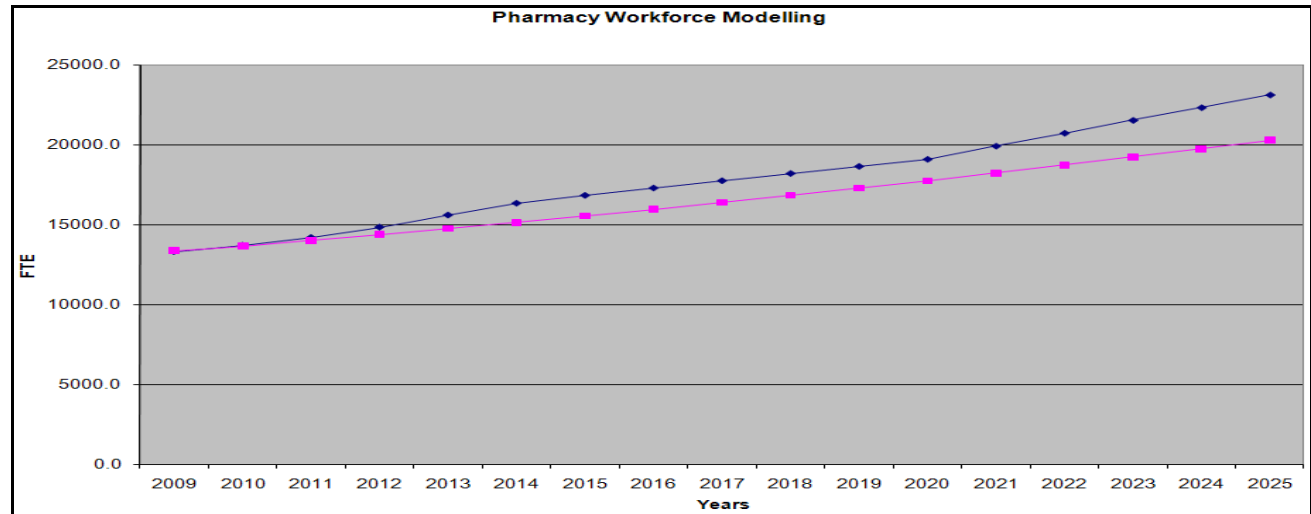
Attempts to generate alternative labour market scenarios which differ from the default settings of the 'Best estimate' labour market scenario or the other two scenarios (Aspirational and Left behind) should be purposeful and not just a random manipulation of a number of variables to 'see what happens'. Like all research and exploration, it is best guided by a hypothesis — that is a sound conceptualisation of what the circumstances of the labour market might be in the future. Then variables can be manipulated to simulate that labour market hypothesis.

Alternatively, specific variables could be manipulated to explore the impact of particular policy interventions — for instance increased funding for home medication reviews that doubled labour demand for review services could be examined. Or, the addition of another School of Pharmacy with say increased total system enrolments of 1% new students per year could be analysed to see the labour market ramifications.

## The outcomes from the model

When values for each of these variables are provided into the model (default values are already inputted and equate to the 'Best estimate' values outlined in Chapter 4) the outcome is a standard supply and demand graph, juxtaposing the two projection estimates. The screen that shows this outcome is shown in Figure 2 below.

**Figure 2: Screen shot of model graph outcome (default 'Best estimate' scenario)**



The model also allows the numbers behind this graph to be displayed.

## Model use and limitations

A guide to the obtaining of the model, loading it onto a local PC, opening and starting the model and using the model to create and save new scenarios is provided in Appendix C and D. This is an operational users guide only and needs to be employed in conjunction with an understanding of each of the variables which is only obtained from the descriptions provided in Chapter 3 of this report. A deeper understanding of the variables and how they were developed can be obtained from the Full Final Report.

Throughout this document any limitations in the model developed are detailed and discussed. Broadly though, any limitations can be classified as within one of three possible classes:

- Limitations that result from an inability to perceive or allow for possible influences on future labour markets. That is, despite the model having 35 variables to manipulate (depending on whether sub-variables are counted), there might still be (indeed probably are) other variables that could have been included in the model which were not identified or were impossible to sensibly model.
- Limitations that result from not allowing sufficient magnitude of change for some variables. As will be seen, each variable has considerable scope to change from default values (the 'Best estimate') and these ranges have been set considering what is realistic. Sometimes though events can be totally unforeseen (e.g. the global financial crisis) that are cataclysmic in effect and make the 'unrealistic' suddenly feasible. Such radical events cannot be accommodated in the model.
- Limitations that result from the narrow focus on qualified pharmacist labour. Some might argue that the 'pharmacy' labour market needs to consider all forms of labour (professional and non professional) simultaneously.

In respect to the last limitation, the model focuses the majority of attention on the professional component of the pharmacy workforce because pharmacist supply must be planned strategically since at least five years is required to prepare a professional pharmacist for workforce entry and there are restrictions on the number of training places in any given year. By comparison, non professional forms of labour, at least in the way they are currently being deployed in community pharmacy, require limited lead time preparation for workforce entry and thus only limited planning is required for this form of labour if pharmacists continue to recruit people with virtually no career preparation and then develop competencies on the job.

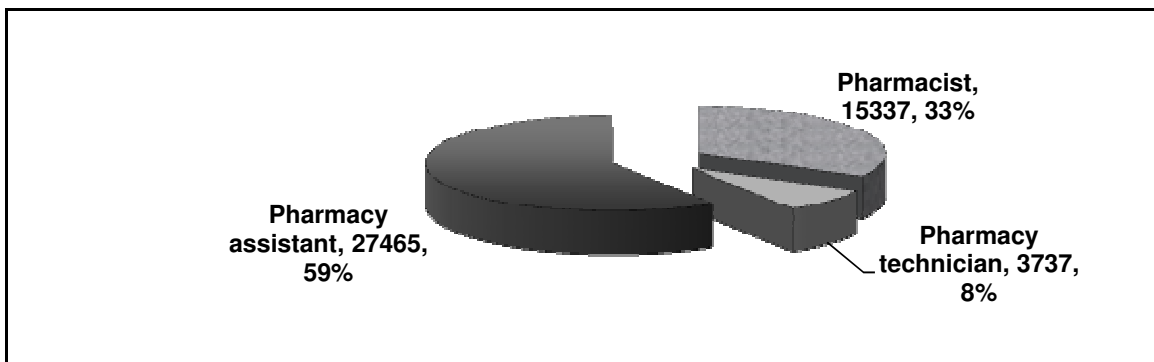
From a demand perspective the model explicitly accommodates non professional pharmacy labour but largely in relation to pharmacist labour especially in the community sector and its capacity to reduce pharmacist labour demand.

## Chapter 3: Description of the model's variables

### Pharmacy workforce overview

According to the 2006 ABS Population and Housing Census data there were 46,539 people employed (that is in the active workforce) in one of the three pharmacist related ANZSCO occupational classifications (ANZSCO 2515-13, ANZSCO 2515-11 and ANZSCO 2515-12), and the two non professional pharmacy workforce ANZSCO classifications (ANZSCO – 311215, ANZSCO - 621411). The two separate forms of non professional labour, namely pharmacy technicians and pharmacy sales assistants, are widely recognised in both the community and hospital pharmacy settings. As can be seen in Figure 3, which presents the 2006 Census of active pharmacy workforce numbers broken down by broad pharmacy labour types, non professional labour numbers significantly outweigh numbers of professionals. This is especially so in the community pharmacy sector.

**Figure 3: Total Australian pharmacy workforce by broad occupation classification**



Source: ABS Population Census data 2006

The current (2006) qualified **pharmacist** active workforce size shows a 25% increase on the 1996 active workforce size (that is approximate compound growth of 2.23 per cent per annum). Like most health workforces, the rate of growth of the pharmacist workforce is slowing; growth in the last five years was only 1.91%.

There is a concentration of pharmacists within the retail or community pharmacy sector, with just on 85% of pharmacists being employed in this sector in 2006. The model makes no distinction on the supply side as to where labour chooses to be employed. This contrasts with the demand side where, because the service delivery conditions which generate demand for labour are quite different, demand for pharmacists in different sectors is modelled independently. In recent years another group of pharmacists has begun to emerge. This group, known as 'consultant pharmacists', is engaging almost exclusively in what has come to be termed cognitive pharmacy services delivery. Demand for this type of labour is also modelled separately.

### Workforce size

The methodology for this study the 'stock' and 'flow' approach to estimating workforce supply was introduced earlier. It was noted that the model calculates flows into and out of the workforce each year and that these calculations are based on rates in relation to the annual active workforce size. Growth is therefore compounded each year.

The compound growth rate approach imposes a significant burden on the accuracy of the initial 'stock' estimate. If this estimate is wrong, then the error is compounded<sup>iii</sup>. The 'stock' component of the model is what currently exists, and according to the 2006 ABS Census of Population and Housing data as noted above there were 15,337 qualified pharmacists employed in the active workforce at the time of the last Census. An alternative way to estimate the size of the pharmacist workforce is to use data from registration authorities. The most recent data on registrations presented to the Australian Pharmacy Council (APC) identifies over 23,000 registrants.

Registration Authority data notoriously over-estimates true workforce size for all health professions including pharmacists and must be adjusted for several possible areas of error. This includes:

- multi-state registrations (AIHW 2003);
- non practising registrants;
- proportion of registrants not in the workforce (AIHW, 2003);

- persons temporarily not working (on leave or looking for work) (AIHW, 2003); and
- bias from a significant non respondent component of the registrant population to the workforce survey.

While the Population Census data too is not without suspected flaws and is generally believed to under-estimate true workforce size<sup>iv</sup>, nevertheless the 2006 Australian Bureau of Statistics (ABS) Population Census data was accepted by this study to be the most accurate available estimate of 'current' workforce size and is used in preference to registration authority data.

## Workforce participation

Workforce participation has two aspects; whether or not a person is working and if they are working how many hours per week. From the perspective of current workforce size, the latter aspect of participation is the more important.

Workforce participation is normally measured in 'full-time equivalent' (FTE) units of analysis. A FTE is simply calculated by adding the hours of work performed during a week and dividing by the number of hours expected to be 'full-time' participation (which for this study has been agreed at 38 hours). Hours in excess of the agreed full-time amount are not counted. Thus a pharmacist who works 20 hours per week has a FTE value of 0.53. Higher FTE fractions close to 1.0 clearly indicate greater levels of workforce participation. The FTE calculation can be done for the entire workforce simply by adding all the hours worked of the workforce during a week and dividing by 38. An FTE conversion factor is used to convert 'head counts' of workers into FTE units — a key requirement when trying to compare workforce supply and demand and wanting to be sure the unit of analysis is common.

Age and gender of the workforce tend to impact most on workforce participation. This is shown in Table 3 below which looks at the FTE conversion factors that would be applied to different age and gender segments of the pharmacist workforce. These FTE conversion factors are calculated from real workforce data.

**Table 3: FTE conversion factors for pharmacists by age and gender**

Age	Under 30	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65 and over	Total
<b>Gender</b>										
Male	0.95	0.96	0.94	0.94	0.94	0.93	0.87	0.79	0.64	0.87
Female	0.94	0.77	0.71	0.74	0.75	0.79	0.77	0.65	0.54	0.78

*Source: AIHW Labour Force Survey, 2003*

According to ABS Population Census data, the average hours of work for pharmacists in 2006 was 37.8. Using the same approach as the two previous HCI studies to calculate a FTE conversion factor<sup>v</sup>, an average conversion factor of 0.82 is obtained. This compares with 0.84 in 1999 and 0.86 in 2001. In the model this average is applied to all forms of workforce to obtain a FTE unit of analysis. It is also applied uniformly over the duration of the workforce plan, that is, until 2025. While this assumption seems counterintuitive, outcomes of testing using of the National Health Workforce Taskforce software, which provides a more sophisticated way of modelling workforce participation, provided support for this approach.

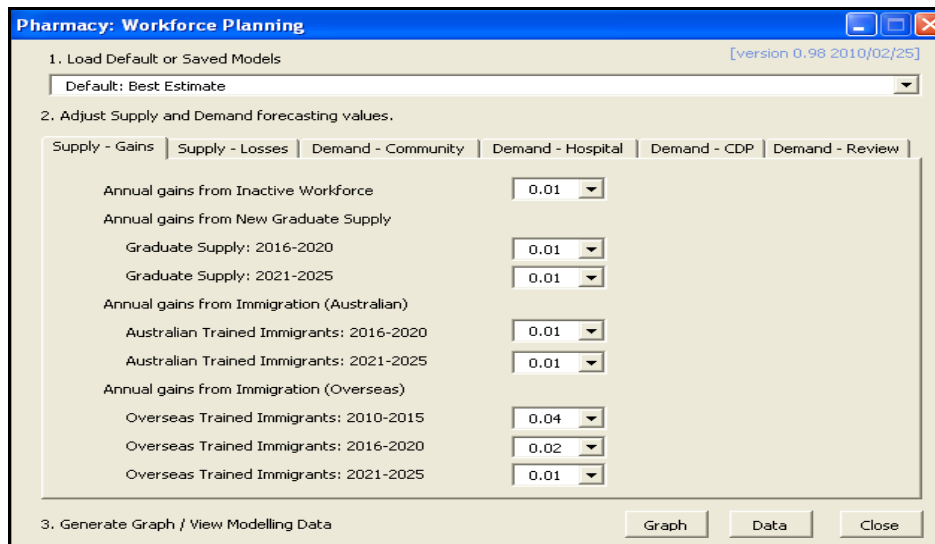
## Gains to the workforce supply

The first tab to be opened in the model to adjust the values of variables in the model is 'Supply – Gains'. The screen for this tab is shown in the Figure below. In this tab there are four main variables:

- Annual gain from the inactive workforce to the active workforce, expressed as a % of the active workforce;
- Annual gains from new graduate supply into the active pharmacist workforce, expressed as a % growth rate on previous year's supply;
- Annual gains from immigration of Australian trained (that is graduates of Australian Schools of Pharmacy) pharmacists, expressed as a % growth rate on previous year's supply; and
- Annual gains from overseas migration of overseas trained pharmacists, expressed as a % growth rate on previous year's supply.

Each of these variables is discussed below.

**Figure 4: Supply - gains database**



These variables (x8), the possible estimates and what they are based on are detailed below.

### Variable 1- Annual gains from the inactive workforce

Of the total qualified pharmacists counted in the 2006 Population Census just under two thirds (62.5 per cent) are in the active pharmacy workforce, an estimated 11 per cent are in the inactive workforce component and a further 10.3 per cent are working outside the pharmacy workforce.

A separate study which surveyed potential re-entrants to the pharmacy workforce, estimated the rate of re-entry to the workforce annually was 1% of the active workforce. The same study found less than 50% of the inactive workforce intended to return to the active workforce within 5 years. If this is applied to the Population Census data as detailed above, then a 1% per annum rate of return seems valid.

Four options are offered in the tool for this variable (the bold option is the default setting). These four options range from a rate of return from the inactive workforce to the active workforce of 0.01% to 1.2% of the active workforce (0.009, **0.01**, 0.011, and 0.012). The selected value applies for the duration of the planning period.

### Variable 2- Annual gains from new graduate supply

Over the last 22 years, from 1985-2007, pharmacy school graduate numbers have grown steadily (with the exception of 1999<sup>vi</sup>). In the decade preceding 1999 (and at least the five years prior to this period also) graduate numbers increased at an annual rate of growth of approximately 4.6%, well above the rate of growth of the population. In the following almost completed decade (2000-2008) a more spectacular growth still has occurred in graduate numbers with an annual rate of increase of over 14%. In 1985 there were 338 pharmacy school graduates; in the most recent year (2008) there were over 1,400 pharmacy school graduates. Since 1997 graduate supply has more than doubled.

Few observers predict that graduate supply growth will continue as it has for much longer. Future enrolments have proven in recent years notoriously difficult to predict. Key informants from the pharmacy school sector suggested none of the current accredited schools would disappear and most, if they are to survive and deliver a sustainable program, will at least have to maintain their current enrolment levels. The financial attraction of pharmacy student numbers makes it unlikely that any of the current larger schools will want to voluntarily reduce their enrolments.

At a series of focus group discussions a “Best estimate” projection of graduate supply presented was that graduate supply would plateau in 2015 and remain steady thereafter. This sparked considerable debate. Few thought that enrolments would be likely to reduce but a major constraint on growth identified was that universities may struggle to find sufficient clinical practice opportunities for undergraduates and preceptorships for graduates. Anecdotal evidence exists that this constraint is already having an impact.

Based on current enrolments estimated graduate supply is essentially determined until 2015. The model then allows two periods of different graduate supply growth from 2016 to 2020 and from 2021 to 2025. These two periods coincide with a possible 6<sup>th</sup> and 7<sup>th</sup> Community Pharmacy Agreement (CPA), although the enrolment decisions that would determine supply in those periods are in fact taken during the 5<sup>th</sup> and possibly 6<sup>th</sup> CPA. In the first period the ‘Best estimate’ allows for modest growth in new graduate supply of 1% per annum, essentially a period of consolidation of enrolment numbers. This is slightly below population growth but would allow the

introduction of at least one new small School of Pharmacy. In the second period, the 'Best estimate' allows for a 2% growth in graduate supply, slightly above the highest population growth.

Eight options are offered in the tool for this variable for both time periods ranging from negative growth of 2% to positive growth of 5% (-0.02, -0.01, 0, **0.01**, 0.02, 0.03, 0.04, and 0.05).

### Variable 3- Annual gains from immigration of Australian trained pharmacists

The trend in enrolments of full fee-paying international students has mirrored the broader trend of enrolments of Australian resident students. Since 80% of international students who graduate from Australian Schools of Pharmacy migrate to Australia using the advantageous conditions accompanying their locally obtained qualifications, there has been a growth in supply from this source similar to that described above for new graduate supply. This is shown in Table 4 below.

**Table 4: Number of pharmacists with Australian qualifications migrating from overseas countries 2001-2007**

year of migration	number obtaining permanent resident status
2001	92
2002	65
2003	77
2004	87
2005	97
2006	153
2007	172
2008	252*

\* Includes 20 immigrants from UK/Ireland who were residual candidates under old reciprocal registration arrangements.

Source: APC 2008

The model assumes the nexus between Australian resident and overseas student enrolments will remain and accordingly the 'Best estimate' of rate of growth in supply from this source will be the same as for new graduate supply.

Eight options are offered again in the model for this variable also for two time periods ranging from negative growth of 2% to positive growth of 5% (-0.02, -0.01, 0, **0.01**, 0.02, 0.03, 0.04, and 0.05).

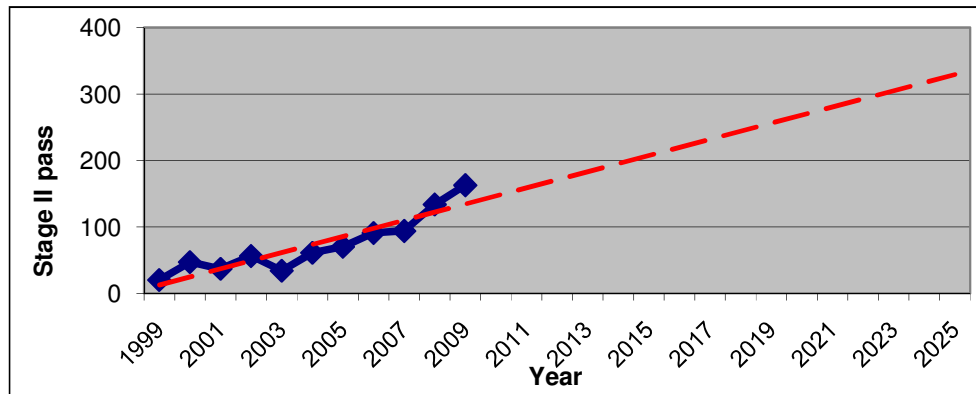
In choosing a value for this variable (or accepting the default value) it should be noted that in addition to those influences that might impact on enrolments, supply from immigration of Australian trained pharmacists is also sensitive to change in immigration policy, particularly any change which might impact on the favoured entry status these immigrants current enjoy.

### Variable 4- Annual gains from immigration of overseas trained pharmacists

Similar to new graduate supply, the increase in numbers of overseas qualified pharmacists migrating to Australia through the APC assessment process has been significant. This is in spite of the process being fairly arduous. Under current regulations (since 1 December 2006), all pharmacists with qualifications obtained from overseas must go through a series of assessments of competence before applying for registration to practise pharmacy in Australia. For most applicants this comprises an eligibility assessment, English test, Stage I examination (a Multiple Choice Questionnaire [MCQ]), a period of up to twelve months' supervised practice in Australia, a National Forensics, Ethics and Calculations Examination [NFECE] and a Stage II examination (comprising an MCQ, a practical and an oral examination).

Trend projections for migration of overseas qualified pharmacists based on the last decade's Stage II exam results are shown in Figure 5 below<sup>vii</sup>.

**Figure 5: Trend of stage of examination passes and certificates issued; 1999 to 2008 actual; 2009 to 2025 trend**



Source: APC, 2008

Observers from the APC do not expect the current trend in immigration growth to continue indefinitely. Rather they anticipate a gradual plateau effect to occur. The model accordingly allows for three separate periods of growth, these periods linked with the 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> Community Pharmacy Agreements. The 'Best estimate' allows for a gradual slowing of the growth rate over these three periods from a high growth rate of 4% in the first period (which allows the significant numbers of APC applicants at various stages of the 'pipeline' to be cleared), to 2% in the second and 1% in the third period. Immigration policy making will be critical to the migration outcomes of overseas trained pharmacists, as well immigration supply is highly sensitive to APC policy determinations, especially any decisions that impact on the examination / assessment process.

Sixteen positive or neutral growth options are offered in the model for this variable for each of the three periods. These 16 options range from no growth in overseas trained pharmacist immigration supply to growth as high as 20% (0, **0.01**, **0.02**, 0.03, **0.04**, 0.05, 0.06, 0.07, 0.08, 0.09, 0.1, 0.12, 0.14, 0.16, 0.18, and 0.2).

## Losses from the workforce

The second tab to be opened in the model to adjust the values of variables in the model is 'Supply – Losses'. The screen for this tab is shown in Figure 6 below. In this tab there are also four main variables:

- Annual loss from the active workforce to the inactive workforce, expressed as a % of the active workforce;
- Annual loss from retirements from the active pharmacist workforce, expressed as a % of the active workforce;
- Annual loss from death or permanent disability from the active pharmacist workforce, expressed as a % of the active workforce; and
- Annual loss from the active pharmacist workforce, expressed as a % of the active workforce, due to overseas migration of Australian trained pharmacists.

**Figure 6: Supply – losses**

The screenshot shows the 'Pharmacy: Workforce Planning' software interface. The window title is 'Pharmacy: Workforce Planning' and the version is '0.98 2010/02/25'. The interface is divided into three main sections:

- 1. Load Default or Saved Models:** A dropdown menu showing 'Default: Best Estimate'.
- 2. Adjust Supply and Demand forecasting values:** This section contains several tabs: 'Supply - Gains', 'Supply - Losses' (selected), 'Demand - Community', 'Demand - Hospital', 'Demand - CDP', and 'Demand - Review'. Under the 'Supply - Losses' tab, the following variables and their values are displayed:
  - Annual loss from Active Workforce: 0.03
  - Annual loss from retirement:
    - Short Term: 2009 - 2013: 0.01
    - Medium Term: 2014 - 2019: 0.03
    - Long Term: 2020 - 2025: 0.01
  - Annual loss from Death & Disability: 0.002
  - Annual loss through Migration Overseas: 0.01
- 3. Generate Graph / View Modelling Data:** This section contains three buttons: 'Graph', 'Data', and 'Close'.

Each of these variables is discussed below.

### Variable 1- Annual loss from the active workforce

The survey of pharmacies sought to gain an estimate for staff turnover from each surveyed pharmacy for the previous 12 months. In order to understand workforce losses, total turnover was analysed by reason for leaving and the subsequent workforce outcome. Most turnover of pharmacists resulted in movement from one pharmacy to another (that is no loss from the workforce) but some turnover did result in loss (e.g. leaving for family reasons, study, other occupation). When this source of turnover only was considered it amounted to 3% of the total active workforce.

Five options are offered in the model for this variable. These five options range from loss to the workforce of 2% to 4% per annum of the active workforce (0.02, 0.025, **0.03**, 0.035, and 0.04). The 'Best estimate' or default setting is bold.

### Variable 2 - Annual loss from retirement

The rate of retirement as an annual loss to the pharmacy workforce is difficult to estimate accurately.

In the general Australian labour market, the average age at retirement for recent retirees (those who have retired in the last five years) was 60.3 years. Within this group, the difference between the retirement age of men and women was relatively small, with women retiring a little younger than men (the average retirement ages for this group were 61.5 years for men and 59.0 years for women).

It is likely that the retirement behaviour of pharmacists reflects a rather older average age characteristic for retirees.

The retirement rate could be volatile given ongoing changes to registration and the difficult current situation with superannuation returns. As such three retirement time periods are given (short term ... 2009-2013, medium term ... 2014-2019 and long term ... 2020-2025) each with their own sets of retirement rate variables. The 'Best estimate' assumes that the rate of retirement will in the short term be low (1% of the active workforce) the result of pharmacists having to work longer to allow their superannuation retirement benefits to recover, it will be high in the medium term (3% of the active workforce) as a 'build up' of retirees is able to retire when superannuation benefits have sufficiently recovered, and again low (1%) in the longer term as the workforce adopts a younger profile.

Four options are offered in the model for each time period of this variable. These four options range from annual loss to the workforce of 1% to 4% per annum of the active workforce (**0.01**, 0.02, **0.03**, and 0.04). The 'Best estimate' or default settings for different periods are in bold.

### Variable 3- Annual loss from death and disability

There is no data available on the death rate of working age pharmacists. However ABS mortality data for ASCO major groupings of 1, 2 and 3 — managers, administrators and professionals — can be used to create an estimate of loss to the pharmacy workforce by death.

For the period 1998-2000 for the age group of 25–54 ('working age'), the recorded mortality rate for these occupational categories was 114.6 deaths per 100,000 for males and 80.7 deaths per 100,000 for females. There

is no comparable data on disability of health professional workforce categories or the impact it has on participation to one's given area of expertise; however, the total numbers lost would be minimal. The effects of death and disability have therefore been grouped together to estimate total loss to the pharmacy workforce.

This provides an annual rate of loss of 0.1% from the active workforce. When presented with this estimate most of the focus groups agreed it was too low. Possibly the reason for this is that nearly 20% of the active pharmacist workforce is older than the ABS 'working age' cohort, and the age specific death rates (ASDR) for age groups above 55 years old increases rapidly. For instance the ASDR for the 65 to 70 year old cohort in the total population is closer to 1% per annum. The 'Best estimate' prediction for annual losses from the active pharmacist workforce the result of death or disability is at a rate of 0.2% of the active workforce.

Three options only are offered in the model for this variable. These three options range from annual loss to the workforce of 0.1% to 0.3% per annum of the active workforce (0.001, **0.002**, and 0.003). The 'Best estimate' or default setting is in bold.

#### Variable 4- Annual loss from migration overseas

Loss to the pharmacy workforce through permanent or long term migration overseas can be measured through 'Overseas Arrivals and Departures' data collected by the Department of Immigration and Citizenship (DOIC 2006).

Over the ten year period from 1996 to 2006, migration of pharmacists had grown steadily in number, peaking in 2006 with 401 qualified pharmacists indicating long term or permanent departure on their emigration cards (DOIC 2006).

The number departing drops sharply in 2007 to 279. The rapid decrease in 2007 is believed not to be an anomaly, but rather the longer term adjustment to a change in legislation for Australian qualified pharmacists being able to transfer their skills and practice to countries such as the United Kingdom. Prior to 2007, Australia and the United Kingdom allowed mutual recognition of registration status. This was withdrawn in 2007 making the process of migration to the UK more difficult.

If the most recent migration figures are adopted then the annual rate of migration from the active workforce would be 1%.

Five options are offered in the model for this variable. These five options range from loss to the workforce of .5 % to 2.5% (0.005, **0.01**, 0.015, 0.02, and 0.025). Given the past overseas migration rates only an increase in the default rate of loss is considered feasible.

## Sources of demand for community pharmacy

Traditionally demand for community pharmacists has been driven by demand for dispensing and related activities—dispensing drugs on doctors' prescriptions and providing the associated advice on their use. Dispensing in community pharmacies, for instance, accounts for about 70% of sales. Additionally the extent of a range of dispensing related or dispensing-like activities—the supply of pharmacy-only, pharmacist-only and other medicines—might be expected to change in ways that parallel changes in dispensing.

The role of community pharmacies and of community pharmacists, however, is changing. This change is evident internationally—in the UK<sup>6</sup>, Canada<sup>7</sup>, and elsewhere. The direction of change is reflected in the Fourth Community Pharmacy Agreement between the Commonwealth Government and the Pharmacy Guild of Australia and recent Commonwealth Government policy directions outlined in the reports *Building a 21<sup>st</sup> Century Primary Health Care System* and *Primary Health Care Reform in Australia* (DoHA 2009) .

Community pharmacists are likely to take an increasingly wider role in primary health care, prompted by a need to better respond to skills shortages and to provide greater access to health care in the context of an ageing population and rising levels of chronic morbidity. Some of the newer tasks for community pharmacy are already in train. One group of tasks sits around better use of medications through improved patient compliance (the Dose Administration Aids Scheme and the MedsIndex e-monitoring compliance) and medication management reviews (the RMMRs and the HMR). A second set of tasks sits around the management of chronic conditions such as type 2 diabetes and asthma and the provision of testing services.

Estimating future demand for community pharmacists is easier for dispensing services, where there is a clearly delineated and documented task mostly funded through a central source. It is more difficult to estimate future demand for pharmacists from the more recently introduced programs, such as those set out in the Fourth Community Pharmacy Agreement. Estimating demand for community pharmacists through further expansion of the scope of community pharmacy into areas that have been the terrain of general practitioners is even more speculative.

The first of the demand modelling tabs is 'Demand – Community' and allows adjustment to a number of variables impacting on community pharmacist requirements. Within this tab provision is made for two main types of variable influencing pharmacist requirements — growth in dispensing activity and growth in new primary health care services (possibly similar to the UK scheme for minor ailments). Other influences on the demand for community pharmacy workforce are covered in the model through tabs 'Demand – CDP' and 'Demand – Review' and these are discussed later.

The 'Demand – Community' tab in the model is shown in Figure 7 below. The tab contains six variables that can be adjusted. The first five variables are all associated with dispensing related activity (which provides the greatest demand on pharmacist labour in the community pharmacy setting) and the remaining variable covers growth in primary health care services:

- Population growth, expressed as a set of growth projections for number and composition of the population;
- Productivity effect: ratio of pharmacy technicians to pharmacists in the dispensary;
- Productivity effect: the technician's equivalence to a pharmacist – the proportion of pharmacist's dispensing work the technician can perform;
- Productivity effect: Annual change in prescriptions a pharmacist can dispense per unit of time;
- Annual change in the average number of prescriptions dispensed per person; and
- Percentage of services now performed by general practitioners that could be performed by pharmacists.

### **Variable 1 - Population growth**

The estimates for population growth have been taken from ABS population projections (ABS 2006). They provide three possible population growth scenarios, Series A, Series B and Series C, with:

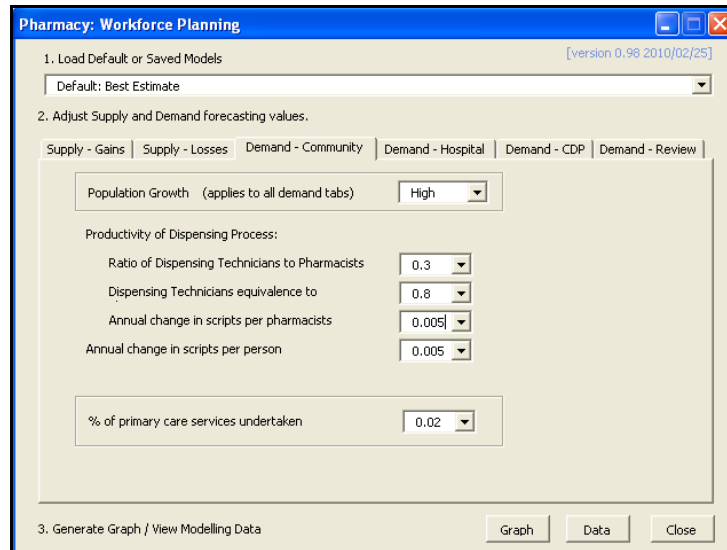
- the first being a high growth scenario (1.9 births per woman and 140,000 persons per year net migration);
- the second a medium growth scenario (1.7 births per woman and 110,000 persons per year net migration); and
- Series C being a low growth scenario (1.5 births per woman and 80,000 persons per year net migration).

The projections estimate not just numbers but also age composition. The high growth scenario results in a younger average population.

Population growth underpins much of the growth in demand for pharmacy services and therefore for pharmacists. This includes for example growth in dispensing and dispensing related or dispensing-like activities, growth in medication reviews, growth in hospital services especially for acute inpatient care, and to a lesser extent growth in primary health care services. Choice of population growth scenario is therefore critical.

Based on recent estimates of current population the default or 'Best estimate' population growth scenario chosen is Series A, the high population growth scenario.

**Figure 7: Demand – community**



## Demand associated with dispensing

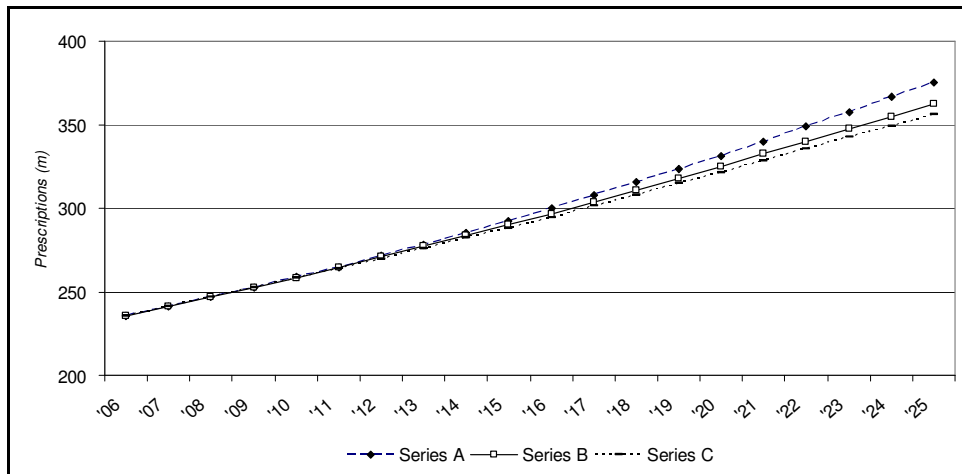
The majority of dispensing activity is funded through the Australian Government's Pharmaceutical Benefits Scheme (PBS). Hence changes in the PBS can affect demand for the pharmacy workforce. Expenditure by the Australian Government on the PBS is large (\$6,882 million in 2008) and has increased substantially from 1992 (\$1,367 million) in nominal dollars.

The number of PBS prescriptions has increased over the period 1992 to 2008 by 72.9% or a compound rate of 3.5% per annum. The increase in the number of prescriptions occurred mainly between 1992 and 2004. After 2004 the number of PBS prescriptions declined slightly in 2005 and 2006 before modestly increasing again in 2007 and 2008. The growth in the number of prescriptions has been partly underpinned by population growth—but overall the increase in the number of prescriptions has exceeded population growth as the number of prescriptions per person has increased.

Demand for community pharmacist labour is also affected by the level of dispensing required of non PBS prescriptions (prescriptions that cost less than the PBS co-payment and prescriptions for medicines or persons not covered by the PBS). The number of non PBS prescriptions has increased strongly since 2000 and in 2006 accounted for 22.9% of all prescriptions.

Allowing for sex- and age specific composition of the three alternate population growth projections which have been made by the ABS ( Series A high, Series B middle and Series C lower) leads to the model of expected growth in overall dispensing between 2006 and 2025 shown in the Figure below.

**Figure 8: Projected growth in prescriptions, 2006 to 2025**

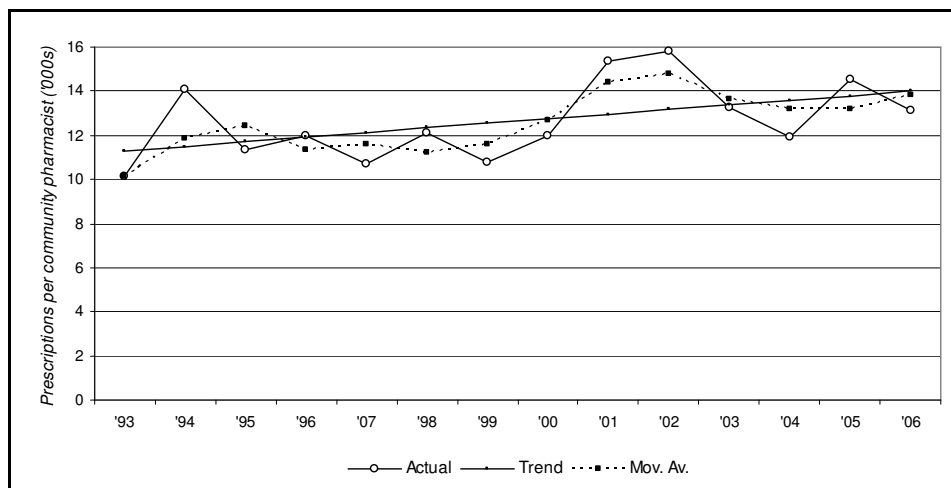


Source: Adapted from ABS, *Population Projections, Australia, 2006 to 2101, 3222.0*; *PBS Item Reports, www.medicareaustralia.gov.au/statistics/pbs\_item.shtml*; and AIHW, *Australia's Health 2008, p. 384*.

The compound annual growth rates in this model are 2.48%, 2.29% and 2.20% for Series A, B and C respectively. To put these values in context, they are higher than past and projected population growth (1.66%, 1.39% and 1.15% respectively), past growth in the number of pharmacists overall (1.84% 1986-2006) or of community pharmacists (2.14% 1986-2006), and higher than past (and especially recent) growth in the number of PBS prescriptions.

The relationship between dispensing volume and pharmacist labour requirements is direct and based on the number of prescriptions per unit of time a pharmacist can dispense. This relationship is captured in Figure 9 below.

**Figure 9: Prescriptions per pharmacist per year, 1993 to 2006**



Source: Online PBS data available at [www.medicareaustralia.gov.au/provider/pbs/stats.jsp](http://www.medicareaustralia.gov.au/provider/pbs/stats.jsp) Reported for calendar year; ABS 3201.0 *Population by Age and Sex, Australian States and Territories. Table 9. Estimated Resident Population By Single Year of Age, Australia. As at 30 June. Actual is the number of prescriptions per community pharmacist; Mov. Av. is the average of the current, preceding and subsequent observation, Trend is the linear regression line. Estimates of the number of pharmacists were smoothed.*

Thus demand for pharmacists due to dispensing and dispensing related activity can be calculated by dividing the population derived number of prescriptions to be dispensed by the number of prescriptions each pharmacist can dispense. Clearly the demand for pharmacists will be highly sensitive to their productivity, that is, how many prescriptions can be dispensed by a pharmacist in a unit of time. Productivity can be influenced positively by use of technicians (to undertake much of the dispensing task placing less burden on the pharmacist), use of other labour substitution mechanisms (e.g. robotics) and more efficient performance of pharmacists in the same task (for instance through the use of epharmacy technology). Productivity can be negatively influenced by pharmacists

spending more time in the dispensing activity (for instance through increased counseling) or by becoming less efficient, by less use of substitute labour or technology or by spending less time in dispensing activities<sup>viii</sup>.

## Variable 2 – Productivity – ratio of technicians to pharmacists

The model explores the possibility that increasing ratios of technicians to pharmacists will satisfy some of any additional demand for dispensing related activity and that therefore technicians will displace community pharmacists.

The ratio of technicians to pharmacists in 2006 is set by Census data (0.22 technicians for every one community pharmacist). The ratio in 2025 can be set close to the 2006 level (that is 2.5 technicians to every 10 pharmacists, a modest growth in the ratio reflecting past trends), in which case the ratio is almost constant and there is little effect on estimates of dispensing related demand for pharmacists. If the assumed 2025 ratio is higher than the ratio in 2006, then the ratio is assumed to increase linearly between 2006 and 2025. The higher the assumed ratio of technicians to pharmacists, the lower the projected number of community pharmacists.

Six options are offered in the model for this variable. These six options range from a low ratio of 2.5 technicians per 10 pharmacists to a high ratio of 5 (or 1 technician per 2 pharmacists). In the model these ratios are displayed as 0.25, **0.3**, 0.35, 0.4, 0.45, 0.5) with all feasible options as a growth in the technician ratio.

Some will consider these ratios to be low and counterintuitive to what is perceived in most community pharmacies where a ratio of closer to 1:1 would be thought to be the norm. Other evidence suggests that the ratio of technicians to pharmacists in the community sector may indeed be higher. For instance the Human Capital Alliance (HCA) survey in 2009 estimated the ratio to be 0.39 technicians for every one pharmacist, while the Guild Census undertaken in 2006 estimated an even higher ratio of 0.41 technicians for every pharmacist. It is clear that ABS coding of 'technicians' is more rigid than that of pharmacists as respondents to the Guild Census and HCA surveys. The latter are more open to classifying any non professional labour as technicians so long as they can play a role in the dispensary — including assistants who might perform some of the dispensary function. Whatever the 'true' extent of the 'technician' contribution to dispensing though, the underlying trends in the model, based as they are on ABS ratios, will remain consistent and true.

## Variable 3 – Productivity –The value of technicians in terms of pharmacists

One technician is unlikely to replace one pharmacist. One indicator of the difference is the relative salaries, although the increasing ratio of technicians to pharmacists suggests that at current salary levels there is still an incentive to employ technicians. The default assumption in the model is that one technician is worth 0.8 pharmacists (at least in terms of the delivery of dispensing services<sup>ix</sup>). So for instance, if one pharmacist could dispense 10 prescriptions per hour, a pharmacist and a technician could dispense 18.<sup>x</sup> Some evidence in support of this estimate is provided from a set of case studies of community pharmacies focused on measuring the contribution of non professional labour (Ridoutt & Bagnulo 2008). Lower value ratios (say 0.6) reduce any impact of higher technician to pharmacist ratios.

Thirteen options are offered in the model for this variable. These 13 options range from a low ratio of technician worth of 40% of a pharmacist to a high worth estimate of 100% of a pharmacist. In the model these ratios are displayed as 0.4, 0.45, 0.5, 0.55, 0.6, 0.65, 0.7, 0.75, **0.8**, 0.85, 0.9, 0.95, and 1). This leaves the most feasible options as a reduced worth of the technician when compared with the default value.

## Variable 4 – Productivity – changes in dispensing per pharmacist

The number of prescriptions per pharmacist (or pharmacist-equivalent) is a partial measure of productivity or efficiency—although this measure does not capture improvements in quality<sup>xi</sup>. Improvements such as automation and e-prescription might increase the number of prescriptions per pharmacist, which will reduce total demand for pharmacists. The default or 'Best estimate' assumes that the ratio of prescriptions to the community pharmacy dispensing workforce grows slightly at half a percent per annum between 2006 and 2025. If a pharmacist dispenses ten prescriptions per hour in 2006, productivity growth of 0.5% implies that by 2025 a pharmacist can dispense about 11 prescriptions per hour. Productivity growth of 1.0% per annum would result in a pharmacist being able to dispense 12 prescriptions per hour by 2025. These changes are separate from any improvements in productivity that might result from employing more technicians per pharmacist.

Long term annual growth in labour productivity in Australia's market economy has been about 1.75%. Measurements of productivity, however, typically exclude industries such as *health*, education, government administration and property and business services or treat them differently and certainly reasonable productivity levels in such industries are considered less attainable. The Australian Government, for instance, has attempted to realise productivity dividends of between 1.00% and 1.25% from its own public service.

A value of 0.005 which corresponds to a compounding increase in the number of prescriptions per pharmacist of 0.5% per annum will *reduce* estimates of future demand for community pharmacists. A value of -0.005 corresponds to a compounding reduction in the ratio of 0.5% per annum and will *increase* demand for community pharmacists.

The model is highly sensitive to this variable and even small changes in the ratio result in significant changes in total demand for pharmacists.

Nine options are offered in the model for this variable. These nine options range from a reduced productivity of 2% to an increase in productivity of 2%. In the model these ratios are displayed as -0.02, -0.015, -0.01, -0.005, 0, **0.005**, 0.01, 0.015, and 0.02.

## Variable 5 – Growth in prescriptions per person

The baseline modelling projects constant sex- and age specific dispensing rates onto the expected increasing population and the ageing of the population profile. The evidence about changes in the sex- and age specific dispensing rates is mixed, possibly as a result as recent changes to the co-payment and related rules. Sex- and age specific PBS dispensing rates have increased in recent years, especially for older persons, who are possibly less affected by changes to the co-payment.

The model provides an option to explore increasing (and decreasing) rates of sex- and age specific dispensing.

Nine options are offered in the model for this variable. These nine options range from a reduction in prescriptions per person of 2% to an increase in prescriptions per person of 2%. In the model these ratios are displayed as -0.02, -0.015, -0.01, -0.005, 0, **0.005**, 0.01, 0.015, and 0.02. As might be expected the outcomes of the model are very sensitive also to changes in the value of this variable.

## Variable 6 – Growth in pharmacy services

This variable is not related to dispensing activity (except in so far as a dispensing action may stimulate other types of services) rather it relates to actions the pharmacist might take in a primary health care role.

The future role of community pharmacy and community pharmacists will be influenced by changes in the broader primary health care system — an area which is the subject of a Commonwealth review. While demand for primary health care services is increasing, there are growing shortages in the primary care workforce, especially among general practitioners.

Current Australian and international developments in pharmacy services point to new areas of primary health care to which pharmacists might contribute. New pharmacy services that could lead to increased demand for pharmacists include:

- **Vaccination:** In the USA, certified pharmacists provide vaccinations. Immunisation is currently one of the more frequent activities of Australian general practitioners—although the work of nurse practitioners in GP clinics focuses on this area of service delivery.
- **Blood testing for hepatitis:** The role of some community pharmacies in providing methadone and needle exchange positions them to conduct blood tests for certain diseases, especially hepatitis B and C.
- **Prescribing:** Pharmacists in the UK are able to prescribe medications independently of a medical practitioner subject to certain protocols. The typical scenarios are for independent prescribing for patients who present with minor ailments or for management of patients with identified clinical conditions for which the pharmacist has specialist training.
- **Point of care testing:** Allowing patients access to a range of health tests and the expertise to interpret their results helps them to maintain good health and, if necessary, better manage their use of medicines. Many pharmacies already provide tests on blood pressure monitoring, cholesterol testing, blood glucose testing, INR testing and bone density testing.
- **Minor ailments scheme:** Pharmacists could treat minor health problems often dealt with by general practitioners. The ‘minor ailments scheme’ in the UK to some extent formalises a role already played by community pharmacists, except that it involves both explicit diversion of patients from GPs to pharmacists when making appointments and a clear funding basis.

The effect of any further changes in the delivery of primary health care on future demand for community pharmacists is uncertain for several reasons. First, they require changes to regulatory and funding arrangements. Second, if implemented, the share of these services met by pharmacists is unclear. Third, the way in which changes might be implemented is uncertain. The Pharmacy Guild, for instance, refers to ‘medication continuance’ rather than prescribing rights, an approach that should reduce the number of GP encounters for ‘prescriptions’ by reducing the need for prescription renewals. However, the context of possible shortages of general practitioners, increased overall health expenditure and international precedent suggest that at least some of these changes are almost inevitable before 2025.

Estimates for this variable are derived by projecting the number of GP services and assuming that a share of these services will be transferred to community pharmacists. An estimate of GP service growth from 2006 is obtained through a proportional relationship to projected dispensing activity. The dispensing growth incorporates any

assumptions about increases in prescriptions per person. The new services are projected to begin in 2011 (and hence exclude any services currently delivered) and increase uniformly to 2.0% in 2025.

The variable allows the choice of a level of GP-equivalent activity for 2025—0% corresponds to no further pharmacy services at all with values greater than zero corresponding to progressively greater demand for community pharmacists. An upper value of 5% has been set. Eleven actual growth options are provided as follows – 0, 0.005, 0.01, 0.015, **0.02**, 0.025, 0.03, 0.035, 0.04, 0.045, and 0.05.

## Demand for Hospital Pharmacy services

Future demand for hospital pharmacists is modelled using sex and age specific hospital separation rates, on the assumption that demand for hospital pharmacy services is, in the first instance, determined by the throughput of hospital patients. Growth in the number of hospital pharmacists is therefore driven initially by population growth and the ageing of the population. There are two broad sets of determinants of demand for the services of hospital pharmacists:

1. The number of people attending hospitals, which is affected by:
  - population size;
  - the age profile of the population;
  - sex- and age specific morbidity;
  - policies about the length of hospital stay;
  - policies about the role of hospitals in treatment; and
  - hospital funding.
2. The ratio of pharmacists to hospital separations, which is affected by:
  - the scope of hospital pharmacy practice;
  - the nature of the tasks pharmacists are required to perform; and
  - the extent and complexity of those tasks, including the number of prescriptions per separation.

Estimates of future demand for hospital pharmacists in the model depend on:

- Estimates of changes in the number and the sex and age distribution of the population (Series A, B and C— see Appendix J in the Full Final Report );
- Sex- and age specific hospital separation rates (and their trends), which in conjunction with population projections, estimate the number of expected separations; and
- The ratio of hospital separations to hospital pharmacists (and its trends), which is used to convert the number of separations into demand for equivalent pharmacists.

The result is four scenarios for each of the population series as follows. The model user can choose one of these four scenarios (the population growth variable would already have been selected in the ‘Demand – Community’ tab).

		Sex- and age specific hospital separation ratios per person	
		Constant	Trend
Hospital separations to pharmacist ratio	Constant	Scenario 1	Scenario 2
	Trend	Scenario 3	Scenario 4

Both trends are positive, that is, they result in higher estimates of the future number of hospital pharmacists:

- The net effect of the sex- and age specific hospital separation rate trends (some trends for younger people are slightly negative) leads to higher separation rates over time, more separations and hence more hospital pharmacists, all else being equal.
- The trend for separations per person is declining, so that over time, for a given number of separations, more pharmacists will be required.

Just like community pharmacy, the efficiency of hospital pharmacists can be influenced by:

- labour substitution, especially of technicians and nurses/nurse practitioners for pharmacists; and

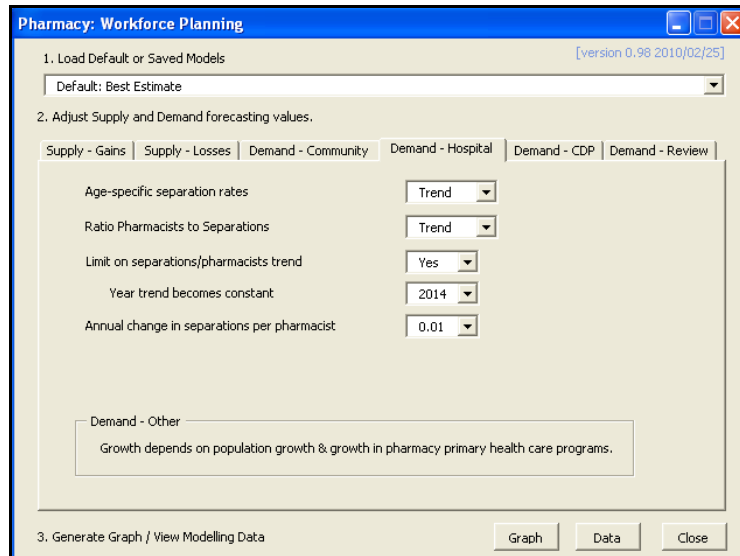
- the efficiency with which the tasks can be completed, which can be affected by workforce organisation, dispensing technology and information technology.

Accordingly the tab **'Demand – Hospital'** in the model allows for adjusting the values of four variables. In this tab the first two variables reflect the two determinants above:

- average separations from hospital per person specific to age and gender groups; and
- average number of hospital separations per pharmacist.

The third variable 'Limit on separations / pharmacist trend' relates directly to the second of the above two variables and allows limitations to be placed on how long the trend continues. The final variable is 'Annual change in separations per pharmacist' and this is a productivity variable. The screen for this tab is shown in Figure 10 below.

**Figure 10: Screen for the variables in the 'demand – hospital' tab**



### Variable 1 – Age specific separation rates

Although it seems likely that age specific hospital separations will increase, possibly in line with past trends (underpinned by increasing morbidity, increasing ability to treat more conditions in more complex ways and a continuing increase in the ratio of separations to hospital days), this is not necessarily the case. A recent report of the National Health and Hospitals Reform Commission envisages a shift in projected health expenditure over the next 25 years away from hospital admissions and pharmaceuticals towards primary medical care and residential aged care (high care)—if its recommendations are implemented (NHHRC 2009).

While a decline in the distribution of (possibly) increased per capita health expenditure to hospital admissions does not necessarily imply a decline in actual expenditure, it might serve to mitigate any increases. Doubts about the extent of any mitigation include the political will (or ability) to implement the recommendations, the time any mitigation would take to implement (given the focus of this report to 2025), especially in the area of health education and modification of health behaviour, and the time required for that effect to flow through to improved health outcomes given the possible pipeline effect of accumulated poor health, especially among older persons. Doubts might exist too around the willingness of governments to invest in new infrastructure—primary health care centres and high care residential aged care facilities—and the time required to construct them.

The model provides for two options — first that separation rates are held 'constant' set at an average of 2006 and 2007 estimates and second that rates are changed according to a trend based on regression of the values (sex and age specific separation rates or hospital separations to hospital pharmacist ratios) over the years 1999 to 2008 (the calculations are based on calendar years).

Setting this variable to 'Constant' reduces projected demand for hospital pharmacists by some 670 FTE hospital pharmacists or about 20% of what it might otherwise be assuming the defaults in the model. Alternatively, 'Trend' can be interpreted as corresponding to compound growth in demand for hospital pharmacists of just over 1% per annum over the period.

Given the caveats above, it seems more likely than not that the current trend toward increasing age specific hospital separation rates will continue and this is the default value in the model.

## **Variable 2, 3 and 4 – Ratio of pharmacists to separations - limit on separations / pharmacist trend**

Separations per hospital pharmacist have declined over the last decade or so—and this trend, coupled with increasing separations, produces estimates of substantial increases in the number of hospital pharmacists required to 2025. The effect is greater than for trends from increasing age specific separation rates. The trend however, is not compelling—the decline in the ratio is hardly uniform and much of the trend depends on the most recent observation for 2008.

There are sound reasons to expect the ratio of separations per pharmacist to decline further—the implementation of the Australian Pharmaceutical Advisory Council (APAC) guidelines on the continuum of pharmaceutical care, the expanded role of hospital pharmacists in wards, possibly more complex dispensing, their expanding role in specialist clinics, their role in after-discharge care, and so on. On the other hand, the consequential growth rates appear very high, especially in a context where expenditure on health services overall may not be expanding. The number of hospital pharmacists, however, is small and so even strong growth in their numbers can be accommodated more easily than might be the case for other, larger, occupations.

The question is how long any decline in the ratio of separations to pharmacists can continue. The reforms to hospital pharmacy and its practice and staffing are still being rolled out progressively. There must be some suspicion that it will not be sustained to 2025. Somewhat arbitrarily therefore, a 'Best estimate' might be that the decline in the ratio of separations to hospital pharmacists ceases no later than 2014.

The model provides for two options — first that separations per pharmacist are held 'constant' set at an average of 2006 and 2007 estimates and second that the ratio is changed according to a trend based on regression of the values over the last decade. If a limit on the trend application is selected then five separate years can be chosen for the limit to take effect; 2010, 2011, 2012, 2013, 2014. The default setting for this variable is to allow the trend to run only till 2014.

The recent trend in the decline in separations per hospital pharmacists has been quite strong. Allowing this trend to continue to 2025 adds to the growth in the number of hospital pharmacists by over 2% per annum or nearly 1300 additional hospital pharmacists (compared with the defaults and holding the effect constant). Limiting the trend 2014 still allows nearly an additional 400 FTE hospital pharmacists given the default assumptions and other effects in the model.

## **Variable 5 – Annual change in separations per pharmacist**

The final variable in the 'Demand – Hospital' tab provides options to adjust the productivity level of the hospital pharmacist workforce (the 'productivity deflator' variable). Productivity is measured through the ratio of separations to pharmacists. If, for instance, the number of patient separations per hospital pharmacist per year was 3,600 and, because of changes in legislation, scope of work, or whatever, it fell by 36 separations (i.e. 1%), so that one hospital pharmacist could deal only with 3,564 separations per year, then, all else equal, the number of hospital pharmacists needed to deal with 3,600 separations would increase by just over 1% ( $3600/3564 - 1 = 0.0101$ ). While the effect is small in any one year, cumulative small annual changes over the period 2006 to 2025 can be large.

This variable is similar to Variable 2, except that Variable 2 is measuring the impact of specific policy changes that have required greater intensity of staffing (such as the introduction of APAC Guidelines). The impact of variable 2 could be anticipated to be short term and finite (although allowance is made to choose an ongoing and longer term influence).

Variable 5 attempts to measure longer term and more subtle influences on hospital pharmacist productivity. As noted earlier with regard to community pharmacists, achieving productivity gains are difficult in the health industry, and measuring gains can be just as hard. 'Efficiency' might improve because of the greater use of technicians to replace pharmacists in the dispensary however this is becoming an increasingly smaller component of total demand for pharmacists in the hospital environment. In other parts of the hospital pharmacist activities substitution is less viable. Another way of increasing the ratio of separations to pharmacists is through improvements in electronic information management. A value of 0.005 corresponds to a compounding annual increase in productivity of 0.5% per annum and a consequent decline in the projected demand for hospital pharmacists. Increasing this ratio (because of improvements in 'productivity') further reduces demand for hospital pharmacists.

Nine options are offered in the model for this variable. These nine options range from a reduction in productivity (separations per pharmacist) of 2% to an increase in productivity of 2%. In the model these ratios are displayed as -0.02, -0.015, -0.01, -0.005, 0, 0.005, **0.01**, 0.015, and 0.02. The outcomes of the model are very sensitive also to changes in the value of this variable.

## Demand for chronic disease programs

Based on the strategic position of community pharmacists, some dispensing related tasks have been expanded further and been incorporated into funded programs under past and current Community Pharmacy Agreements motivated by evidence of their clinical and economic efficacy. These include:

- HMRs and RMMRs which use the knowledge and skills of pharmacists to ensure that patients with new or complex medication regimens receive the appropriate medications. These are modelled separately and discussed later in this Chapter.
- The Pharmacy Asthma Management Service (PAMS) and Diabetes Medical Assistance Service (DMAS) are still relatively new and are developing through expanded pilot programs. Their intent is to use the knowledge and skills of pharmacists to improve monitoring, use and compliance among adults already diagnosed by a general practitioner as having chronic asthma or diabetes 2.
- Convenient services such as blood pressure monitoring, cholesterol testing and blood glucose testing provide a basis for patient awareness, self management and treatment of their condition and referral.
- Many pharmacies also offer a range of programs that address issues of primary health care such as weight loss services, depression awareness and referral and smoking cessation programs.
- Community pharmacies have also become the site of specialist clinical services such as wound management, continence and baby health clinics—services that may involve working with other allied health professionals in the community pharmacy setting.
- Only the first two of the above dot point programs have actually received funding. Accordingly they have been modelled for impact on pharmacist demand. The variables underpinning estimates of demand for the asthma (PAMS) and diabetes (DMAS) programs and able to be manipulated are in the tab 'Demand – CDP'. The screen for this tab is shown in Figure 11 below.

**Figure 11: Screen for the variables in the 'demand – CDP' tab**

In this tab there are seven main variables:

- asthma - proportion of expected GP asthma management encounters at period end;
- asthma - hours per asthma consultation;
- asthma - proportion of work performed by community pharmacies;
- diabetes - trend in incidence of GP managed diabetes encounters;
- diabetes - proportion of expected GP managed diabetes encounters at period end managed by pharmacists; and
- diabetes - Proportion of total diabetes encounters Proportion of work performed by community pharmacies Type 2.

## **Diabetes - Proportion of work performed by community pharmacies**

### **Asthma variables**

The PAMS is being introduced in community pharmacies. The service provides patients with regular consultations to assist them to manage their asthma. The consultations focus on the safe and effective use of their asthma medications by helping patients to understand the requirements for the long term management of their asthma. It will complement asthma management plans or other arrangements with the patient's GP or other medical support.

PAMS is part of the Asthma Pilot Program, which funded from the Fourth Community Pharmacy Agreement. While the program is still in an extended implementation and evaluation phase, it is based on earlier trials and successful international programs. In 2009, 100 accredited pharmacies have recruited a total of 1,000 patients to the program in four jurisdictions.

The estimates of the demand for pharmacists created by the PAMS and other future pharmacy-based programs to assist asthma sufferers is motivated by Bettering the Evaluation and Care of Health (BEACH) data on estimates of the number of GP encounters at which asthma is managed, projecting these sample estimates to the population and expressing them as a proportion of the population. Population projections are then used to estimate likely future numbers of GP managed asthma occasions of service.

Although age specific rates of GP asthma management differ, it is not a pattern that necessarily leads to a focus on older persons. At the same time, PAMS focuses on asthma in adults. The population motivating the estimates is therefore persons 18 years or older. Based on other BEACH data, the proportion of adult GP managed encounters for asthma is assumed to be 74.5%, although there are indications that the level of adult asthma is declining. The estimated incidence of adult GP managed asthma encounters has been constant over the last few years (2005-06 to 2007-08) at about 16.07 per 100 adults. This rate is then projected onto growth of the adult population to 2025 and with assumptions about the equivalent proportion managed by pharmacists, converted to the number of equivalent full-time pharmacists required to manage the encounters.

### **Variable 1 - Proportion of expected GP asthma management encounters at period end**

Pharmacy provision of asthma management services can be expected to expand over the period—from negligible in 2006 to something more than that by 2025. The extent to which this growth will occur is impossible to predict. Expressing the growth as a proportion of expected GP asthma management encounters provides a context for these estimates. Although expressed as a proportion of GP asthma management encounters, it does not imply an equivalent shift of management from GPs to community pharmacy. Part of the motivation of PAMS is to bring care to persons whose asthma management had been problematic and whose condition may therefore not have been managed by a GP.

The number of patients involved in PAMS will be less than the number of consultations. PAMS is part of an ongoing management of asthma and patients could typically expect several consultations with their community pharmacist.

Seven options are offered in the model for this variable. These seven options range from a low share of GP encounters at the end of the plan period of 1% to a high share of GP encounters transferring to pharmacist management of 5%. In the model these shares are displayed as 0.01, 0.025, 0.03, 0.035, 0.4, 0.045, and 0.05. The total pharmacist demand outcomes of the model are not so sensitive to changes in the value of this variable since there is such a low starting base number.

### **Variable 2 - Hours per asthma consultation**

Converting the estimated number of asthma consultations into a corresponding estimate of the number of full-time pharmacists requires an estimate of the time required for an asthma consultation. The model sets the default time per asthma consultation as just under one third of one hour (0.3 hours).

Six options are offered for adjustment of this variable within the model. These options are 0.2, 0.3, 0.4, 0.5, 0.06, 0.07 hours per consultation.

### **Variable 3 – Community Pharmacy Proportion**

This variable is included in all of the areas of funded non dispensing pharmacist activity, notably the chronic disease support services and the medication review services. This variable has no impact on the size of total demand for pharmacists, but rather *distributes* the demand between 'community' pharmacy and 'other' pharmacy components. In each case the variable can be adjusted between 0% and 100%, in which case none of the demand or all of the demand is allocated to community pharmacy respectively.

The options are expressed as follows; 0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0.

The default setting for this variable is 1.0, because the way the funding is set up only community pharmacies are able to provide and claim the service fee. This means all of the demand generated for PAMS is distributed to

community pharmacy. This could change in the future, and consultant pharmacists might be allowed to provide the service on behalf of community pharmacists similar to home medication reviews. This would still have no impact on total pharmacist demand.

## Diabetes variables

Through the DMAS, community pharmacies may play a more important role in helping the increasing number of people with type 2 diabetes to manage their condition. The move to initiate this program follows similar innovations in community pharmacy internationally and earlier research and pilot studies in Australia. The implementation of DMAS is being funded through Diabetes Pilot Program, which is part of the Fourth Community Pharmacy Agreement.

DMAS provides patients with type 2 diabetes with a program of assessment, management and review of their condition to improve their knowledge, compliance, monitoring and outcomes. It is provided by a DMAS-accredited pharmacist at an accredited community pharmacy in collaboration with a patient's GP and other members of a diabetes care team.

The Diabetes Pilot Program is investigating the feasibility of implementing the DMAS in community pharmacies across Australia. Although it is still in an evaluation and research phase, a significant number of community pharmacies and pharmacists are now accredited to provide the service. Participating pharmacies receive a one-off 'readiness' payment of \$500 and can receive a training subsidy. Once a patient has attended their cycle of DMAS consultations (or has permanently withdrawn from the service) DMAS Providers may submit an online claim for a service payment for that patient of up to \$352.

Diabetes is mainly a disease of older persons—the rate of diabetes type 2 increases markedly beyond age 45. Estimates of the increase in the level of diabetes are based on changes in the population of persons 25 and over and assumptions about the trend of the incidence of type 2 diabetes. Growth in the incidence of type 2 diabetes translates into demand for pharmacists through assumptions about the proportion of treatments of type 2 diabetes delivered through a community pharmacy at the end of the planning period (2025).

### Variable 4 – Trend incidence of managed diabetes GP encounters

BEACH data are used to estimate the incidence of persons whose diabetes 2 is managed in visits to GPs. BEACH sample data on GP encounters can be extrapolated to the population through annual numbers of GP MBS items and to the number of managed conditions by using the BEACH ratio of encounters to managed conditions.

The resulting population incidence of GP managed diabetes encounters is increasing by 1.08% per annum.

The options in this variable are related to assumptions about whether the growth trend of 1.08% per annum will continue or whether growth will be slower or faster. For instance, an option of 100% projects this linear increase from 2008 to 2025. A choice of 0% continues the incidence at 2008 levels and any growth simply reflects population growth.

Eleven options are offered for adjustment of this variable within the model. These options range from 0% (no trend growth and any growth only driven by population growth) to 200% (growth is double the current trend of 1.08% per annum, that is 2.16% per annum). These options are represented as follows: 0, 0.2, 0.4, 0.6, 0.8, **1.0**, 1.2, 1.4, 1.6, 1.8, 2.0. The default setting is 100%.

### Variable 5 – Proportion of expected GP diabetes management encounters at period end

Pharmacy provision of diabetes services can be expected to expand over the period—from negligible in 2006 to something more than that by 2025. The extent to which this growth will occur is impossible to predict. Expressing the growth as a *proportion of expected GP diabetes management encounters* is a device that provides a context for these estimates. Although expressed as a proportion of GP diabetes management encounters, it does not imply a full shift of management from GPs to community pharmacy. Part of the motivation for DMAS is to bring care to persons whose diabetes 2 management had been previously negligible or intermittent and whose condition may therefore not have been treated by a GP (or treated as well).

The number of managed encounters does not correspond to the number of patients in the DMAS program. Participants completing the program can expect about six consultations with their community pharmacist over a period less than a year.

Seven options are offered for adjustment of this variable within the model. These options range from 1% (limited proportion of GP encounters delivered a service by a pharmacist) to 5% of the GP encounters also being serviced by a pharmacist. These options are represented as follows: 0.01, 0.015, 0.02, 0.025, 0.03, 0.035, 0.04, 0.045, **0.05**. The default setting is 5%.

## Variable 6 - Proportion of managed GP encounters with type 2 diabetes

The BEACH data that motivates the estimates of diabetes 2 managed encounters in fact combines type 2 diabetes with type 1 and gestational diabetes because of difficulty in separating the various forms of diabetes. Other estimates from BEACH suggest that type 2 diabetes was about 85% of all managed diabetes encounters and that this changed little between 1998-99 and 2006-07. The age distribution of types 1 and 2 diabetes are different, however, and managed encounters of type 2 diabetes among adults is likely to be higher than 85%.

Five options are offered for adjustment of this variable within the model around the BEACH estimate of 85% (this is also the default or 'Best estimate' setting). These options range from 81% proportion of all diabetes encounters being type 2 to 89% of total encounters. These options are represented as follows: 0.81, 0.83, **0.85**, 0.87, 0.89. The default setting is 0.85.

## Variable 7 - Hours per DMAS consultation

Converting the estimated number of DMAS consultations into a corresponding estimate of the number of full-time pharmacists requires an estimate of the time required to complete a DMAS consultation. It is estimated that a DMAS requires approximately 20 minutes to deliver. Some of the time required for consultations (record keeping, making appointments) can be provided by appropriately trained pharmacy assistants.

Six options are offered for adjustment of this variable within the model. These options are 0.2, **0.3**, 0.4, 0.5, 0.6 and 0.07 hours per consultation. The default setting is 0.3 or 18 minutes of pharmacist time in the consultation.

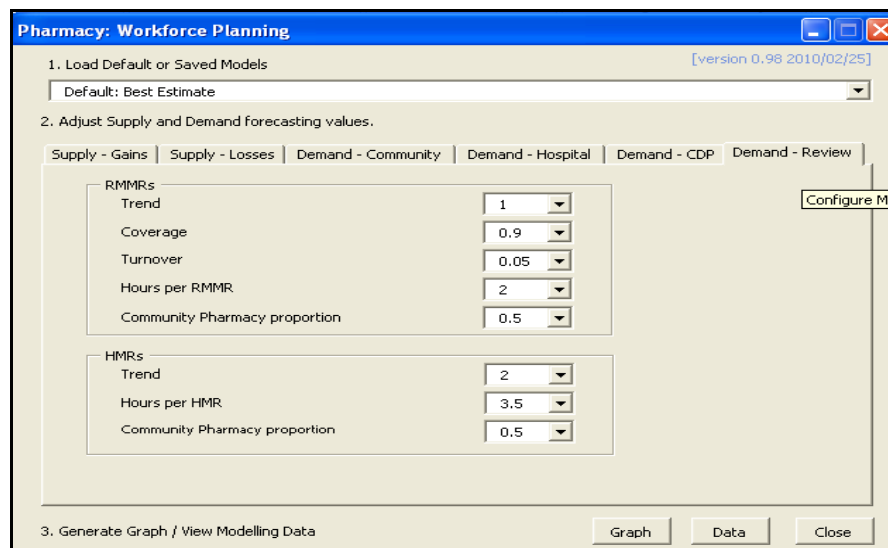
## Variable 8 – Community pharmacy proportion

See Variable 3 above. The default setting for this variable is 1.

## Demand for medication review services

The final tab to be opened in the model to adjust the values of variables in the model is 'Demand – Review'. The screen for this tab is shown in the Figure below.

Figure 12: Screen for the variables in the 'demand – review' tab



In this tab there are six main variables:

- RMMR – Trend in age specific rates of residency in nursing homes;
- RMMR – Coverage of nursing homes and residents;
- RMMR – Turnover of residents of nursing homes;
- RMMR - Hours required per RMMR; and
- HMR – Trend in age and sex-specific rates of HMRs.

### ***HMR – Hours required to perform a HMR***

#### **Demand for RMMRs**

RMMRs are reviews conducted by an accredited pharmacist of the medications being taken by permanent residents of aged care homes who are receiving Commonwealth-subsidised aged care. They are intended to

contribute to the health of residents by ensuring that their medications are appropriate—for instance, that there are no contra indications that haven't been identified. RMMRs are conducted by an accredited pharmacist and can be initiated by the pharmacist or in collaboration with a general practitioner.

An RMMR is available to a new resident on admission to an aged care home and once a year thereafter or where there has been a significant change in the resident's medical condition or medication regimen. Any person involved in the care of a resident can request an RMMR.

As the Australian population increases and ages the number of persons in residential aged care homes is expected to increase. A decline over the last decade in the age specific rates of residency in nursing homes provides a countervailing influence to this growth. The demand for RMMRs then depends on both coverage of aged care homes by accredited pharmacists and the turnover of nursing home residents, including events such as a hospital separation that can lead to more than one RMMR in a year.

### **Variable 1 – Trend in rates of residency in nursing homes**

Age specific rates of residency in nursing homes have declined over the last decade, possibly associated with policies that emphasise care for the elderly in the community rather than in aged care homes. A value of 100% projects the decline in age specific residency rates over the last decade forward from 2008 to 2025. Values greater or less than 100% fit higher or lower trends from 2008 onwards. A value of 0% projects the number of nursing home residents using the age specific rates of 2008.

Eleven options are offered for adjustment of this variable within the model. These options are 0, 0.2, 0.4, 0.6, 0.8, 1, 1.2, 1.4, 1.6, 1.8, 2. The default setting is 1 or which is 100% of the trend projected forward to 2025.

### **Variable 2 - Coverage of nursing homes and residents**

Not all nursing homes and residents may be covered by arrangements that encourage or facilitate RMMRs, although the registration and quality of care requirements for nursing homes is increasingly ensuring high coverage rates.

Ten options are offered for adjustment of this variable within the model. These options are 0, 0.2, 0.4, 0.6, 0.7, 0.8, 0.85, 0.9, 0.95 and 1. The default setting is 0.9 or 90% of all nursing homes / residents.

### **Variable 3 – Turnover of residents**

Measures of the number of residents at a single point in time does not capture the full demand for RMMRs. RMMRs can be triggered by entry to a nursing home and hence more closely reflects the number of residents in nursing homes over a full-year. Increasing care for the elderly in the community setting may increase turnover as residents spend less time in nursing homes. Turnover can also result from the same resident receiving more than one RMMR in a year because of events such a separation from hospital or changes to medication.

Eleven options are offered for adjustment of this variable within the model. These options are 0, 0.005, 0.01, 0.015, 0.02, 0.025, 0.03, 0.035, 0.04, 0.045 and 0.05. The default setting is 0.05 or 5% of nursing home beds / residents require an additional RMMR.

### **Variable 4 - Hours per RMMR**

Converting the estimated number of RMMRs into a corresponding estimate of the number of full-time pharmacists require an estimate of the time required to complete an RMMR. A full-time pharmacist is deemed to have 1,840 working hours available during a year (46 weeks with 40 hours per week). If RMMRs took an average of two hours each to complete, then 1,840 RMMRs would generate demand for half a full-time pharmacist for a year.

An indication of the time taken to complete an RMMR can be derived from estimates of the time taken for an HMR and the relative remunerations. If the average time required for an HMR is 3.5 hours and the remuneration for an RMMR is \$130 compared with \$190.64 for an HMR, then the corresponding time required for an RMMR is 1.5 hours. Alternatively a time of 1.5 hours per RMMR translates into gross annual income of about \$100,000, which, with some on-costs and overheads might be a little low (depending on how the RMMRs are arranged).

The development of software in recent years to assist pharmacists to complete RMMRs might have reduced the time required to complete them.

Eleven options are offered for adjustment of this variable within the model. These options range from 30 minutes to three hours. They are represented in the model as 0.5, 0.75, 1, 1.25, 1.5, 1.75, 2, 2.25, 2.5, 2.75 and 3 hours per consultation. The default setting is 2 hours of pharmacist time in the consultation.

### **Variable 5 – Community pharmacy proportion**

This variable is has been covered earlier under the 'Demand – CDP' area.

The options are expressed as follows; 0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0.

The default setting for this variable is 0.5.

## **Demand for home medicines reviews**

A HMR is the community-equivalent of an RMMR. It is the pharmacy component of a general practitioner initiated Domiciliary Medication Management Review (DMMR), which is intended to maximise patients' benefits from their medications. In collaboration with the patient's GP and coordinated through a community pharmacy, an accredited pharmacist conducts a home visit to review a patient's medications. After discussing the findings and report with the pharmacist, the GP and patient agree on a medication management plan.

A patient can have a DMMR once every 12 months or sooner if there has been a significant change in the patient's condition or medication requirements. Factors that predispose people to medication related problems include:

- currently taking five or more regular medications;
- taking more than 12 doses of medication/day;
- significant changes made to the medication regimen in the last 3 months;
- medication with a narrow therapeutic index or medications requiring therapeutic monitoring;
- symptoms suggestive of an adverse drug reaction;
- sub-therapeutic response to treatment with medicines;
- suspected non compliance or inability to manage medication related therapeutic devices;
- patients having difficulty managing their own medicines because of literacy or language difficulties, dexterity problems or impaired sight, confusion/dementia or other cognitive difficulties;
- patients attending a number of different doctors, both general practitioners and specialists; and/or
- recent discharge from a facility/hospital (in the last 4 weeks).

The age and sex-specific rates of DMMRs have been increasing since the introduction of the program. These rates are projected to continue to increase over coming years.

## **Variable 6 – Trend in rates of HMRs**

Age and sex-specific rates of HMRs have increased 2002 to 2008—and values for 2009 to September show a continuing increase. A value of 100% projects the increase in age and sex-specific HMR rates forward from 2008 to 2025. Values greater or less than 100% fit higher or lower trends from 2008 onwards. The initial take-up of HMRs may have been inhibited by lower-than-current payments—if so, the observed trend to date may be lower than future growth.

The potential demand for HMRs is unknown—although not everyone taking multiple medications is likely to need an HMR every year, other indications such as hospital separations and patient-related compliance problems will add to demand. Some estimates suggest that between 43% and 55% of elderly patients take four or more medications daily. A trend of 2000% might be an upper limit reaching 100% coverage by 2025.

Seven options are offered for adjustment of this variable within the model. These options are 0, 0.5, 1, 1.5, 2, 5 and 10. The default setting is 2 or which is double the current trend projected forward to 2025.

## **Variable 7 - Hours per HMR**

Converting the estimated number of HMRs into a corresponding estimate of the number of full-time pharmacists requires an estimate of the time required to complete an HMR. If a full-time pharmacist has 1,840 working hours available during a year (46 weeks<sup>xii</sup> by 38 hours per week) and an HMR takes an average of three and a half hours to complete, then one full-time pharmacist could conduct 526 HMRs in a year.

At \$190.64 per HMR and 3.5 hours per HMR, the corresponding gross annual income is about \$175,000, which, after allowing for some on-costs and overheads, may be consistent with overall salary levels for pharmacists.

The development of software to assist pharmacists to complete HMRs might have reduced the time required to complete them.

Nine options are offered for adjustment of this variable within the model. These options range from one hour to five hours. They are represented in the model as 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5 hours per consultation. The default setting is 3.5 hours of pharmacist time in the consultation.

## **Variable 8 – Community pharmacy proportion**

See Variable 5 above. The default setting for this variable is 0.5.

## Future demand for ‘other pharmacist’ workforce

The ‘other’ category is used to indicate pharmacists who are not community or hospital pharmacists. They are a small proportion of all pharmacists (6.4% in the 2006 Census) and are numerically small (587). The increase in pharmacy services (especially, but not only, medicines reviews) delivered by specialised consultants outside community pharmacies or hospitals makes this an interesting category. The category, however, includes pharmacists in a range of activities—22.4% work in industry; 16.4% are in administration, 14.9% in education, leaving 46.3% still defined as ‘other’.

ABS Labour Force Survey data indicates that the number of ‘other’ pharmacists declined at an annual compound rate of 0.81% between 1987 and 2008. Allowing for possible sensitivity to the choice of start and end points for the time series, the average of growth rates for the five periods 1987-04, 1988-05, 1989-06, 1990-07 and 1991-08 was lower still at minus 1.28% pa.

Estimates of the future number of ‘other’ pharmacists need to consider three characteristics of the category.

1. Long term growth has been low. It would therefore not be appropriate to base estimates of future demand on influences that are likely to lead to rapid expansion.
2. Growth for some of the identifiable sub-categories is likely to be modest. The number of administrators and academics within this category is unlikely to expand much beyond increases in the overall workforce.
3. A relatively new element consisting of consultant pharmacists mostly working on medicines reviews is likely to be growing fairly strongly.

A conservative approach, therefore, is to model future growth on changes in the number of persons aged between 25 and 64. The growth of this population should broadly mirror the growth of the workforce to 2025. A separate element of the category is based on growth of medicine reviews and has already been described.

The projected growth rates of the ‘Best estimate’ are reasonably modest in the context of some of the projected rates of growth of community and hospital pharmacists and are somewhat sensitive to the choice of population projection. Most of the growth results from the ‘consultant’ group.

## Summary of variables

In the Table below an overview of all the variables in the model is provided with the default or ‘Best estimate’ scenario settings.

**Table 5: Summary of model variables with default settings**

variable	best estimate	actual default setting
<b>supply gains</b>		
annual gains from Inactive Workforce	1%	0.01
annual gains from New Graduate Supply		
graduate supply 2016 – 2020	1%	0.01
graduate supply 2021 - 2025	1%	0.01
annual immigration gains from Australian trained graduates		
Australian trained pharmacist immigration 2015 – 2019	1%	0.01
Australian trained pharmacist immigration 2020 - 2025	1%	0.01
annual immigration gains from overseas trained pharmacists		
immigration of overseas trained pharmacists 2010 - 2015	4%	0.04
immigration of overseas trained	2%	0.02

variable	best estimate	actual default setting
pharmacists 2010 - 2015		
Immigration of overseas trained pharmacists 2010 - 2015	1%	0.01
<b>supply losses</b>		
annual loss from active workforce	3%	0.03
annual loss from retirement		
short term 2010-2013	1%	0.01
medium term 2014-2019	3%	0.03
long term 2020-2025	1%	0.01
annual loss from death & disability	0.2%	0.002
annual loss through Migration Overseas	1%	0.01
<b>community demand</b>		
population Growth		High (A)
productivity of dispensing process:		
ratio of dispensing technicians to pharmacists	3:10	0.3
dispensing Technician equivalence to a pharmacist	80%	0.8
annual change in scripts per pharmacist completed	0.5%	0.005
annual change in scripts per person prescribed	0.5%	0.005
% of primary care services undertaken by pharmacists	2%	0.02
<b>hospital demand</b>		
age specific separation rates		Trend
ratio pharmacists / separations		Trend
limit on separations / pharmacists trend		Yes
annual change in separations per pharmacist	1%	0.01
<b>demand for chronic disease programs</b>		
asthma - % GP asthma encounters at end	5%	0.05
asthma - Hours / encounter	18 minutes	0.3
asthma - Community pharmacy %	100%	1
diabetes - trend	100%	1
diabetes - % GP diabetes encounters at end	5%	0.05
diabetes - % of diabetes type 2	85%	0.85
diabetes - Hours / encounter	18 minutes	0.3
diabetes - Community pharmacy %	100%	1
<b>demand for medication reviews</b>		
RMMR trend	100%	1

<b>variable</b>	<b>best estimate</b>	<b>actual default setting</b>
RMMR coverage	90%	0.9
RMMR turnover	5%	0.05
hours per RMMR	as is	2
community pharmacy %	50%	0.5
HMR trend	200%	2
hours per HMR	as is	3.5
community pharmacy %	50%	0.5

## Chapter 4: Discussion of possible labour market scenarios

### Three possible scenarios

In this Chapter three exemplar labour market scenarios are constructed and described as a way of increasing the understanding of (a) how the model can be used and (b) how the outcomes can be interpreted and acted upon.

Obviously the first to explore is the '**Best estimate**' scenario that has been thoroughly described in prior chapters. The 'Best estimate' accepts the default settings of the model (see Table 5). The other two scenarios to be explored are an '**Aspirational world**' and a '**Left behind world**'. In Chapter 2 these two scenario options were introduced briefly along with the advice that the model should not be used for 'suck it and see' type investigations, rather construction of different scenarios should be underpinned by purposeful manipulation of selected variables based on a hypothesised labour market. These two scenarios are described in more detail here.

The two exemplar labour markets were both hypothesised at a Search Conference held in early 2009 (see Freeman and Ridoutt, 2009). A description of the hypothesised '**Aspirational world**' highlights the following main characteristics:

- Primary health care is patient-directed and delivered to those who require it (timely accessible, quality, etc) in the community. Pharmacists aspire to use their advanced clinical knowledge, skills and specialisations in providing patient-focused pharmaceutical care.
- Primary health care is a dominant and an integrated feature of pharmacy practice. Pharmacists participate in delivery of multi-disciplinary, collaborative health care at all levels of the health system and across all settings. Pharmacists are recognised as part of the "healthcare team" and a central component in the delivery of healthcare to the community.
- Pharmacists' therapeutic skills are recognised as unique and adding significant value to health outcomes.
- Increasing numbers of pharmacists together with shortages of other healthcare professionals such as general practitioners and nurses further facilitates the provision of pharmaceutical care.
- Pharmacists deliver patient-focused pharmaceutical care utilising a range of models and locations as appropriate to the patients needs and the needs of the community in which they work to maximise outcomes and to integrate pharmaceutical care into the delivery of healthcare to the community.
- Increasing availability and abilities of technology, in particular eHealth are integrated into pharmacy practice, allowing pharmacists to better provide effective pharmaceutical care.
- Healthcare funders demand greater value for money, greater accountability of health professionals and measureable health outcomes. Funders, including government, and consumers recognise the value of pharmaceutical care and continue to provide funding to support the equitable and accessible delivery of pharmaceutical care to all Australians.
- Increasing cultural diversity will increase the range of therapies available and used in the community and will also provide challenges in the understanding and communication necessary to ensure optimal therapeutic outcomes. Pharmacists recognise and respond positively to these implications through education and training to develop cultural competency and by providing cultural competent pharmaceutical care.

In the 'Left behind world' the key characteristics were described as:

- Primary health care is dominant but has not been effectively integrated into pharmacy practice. It will be patient-directed and delivered to those who require it (timely accessible, quality, etc) in the community but tends to be *external* to pharmacy practice. There is consumer demand for pharmaceutical care that meets their medication related health needs but which pharmacists fail to adequately satisfy.
- Pharmacists' therapeutic skills are no longer recognised as unique and other health professions are increasingly substituting for traditional and emerging pharmacist roles.
- Pharmacists are isolated in their practices (pharmacy-centric) and do not utilise a range of models and locations appropriate to maximise outcomes and to integrate CPS into the delivery of healthcare to the community. They are wedded to the notion of developing a range of disconnected CPSs.
- Pharmacists are not recognised as part of the "healthcare team" or considered to be a central component in the delivery of Healthcare to the community.
- Increasing availability and abilities of technology, in particular eHealth are not integrated into pharmacy practice limiting the ability of pharmacists to incorporate primary health care and CPS into mainstream healthcare services.
- There is an increase in the ability of technologies, including decision support technologies, to substitute in part or in full for technical roles which might otherwise have been provided by pharmacists.
- Funders, including government, industry and consumers recognise the value of cognitive pharmaceutical services and continue to provide increased funding to support their growth but, are confused by the array of services continually being developed in pharmacy and the lack of a consistent, recognisable model of patient-centred pharmaceutical care and the different funding models for each service and will increasingly look to alternate mechanisms and providers as pharmacists are unable to present a consistent approach to professional service delivery.
- Increasing cultural diversity will increase the range of therapies available and used in the community and will also provide challenges in the understanding and communication necessary to ensure optimal therapeutic outcomes. Pharmacists fail to recognise or respond adequately to these implications. Increasingly seen as retailers who provide little information or support when patients seek advice on use of these therapies.

In the Table below the variables adjusted to create these two scenarios are detailed in comparison with the default or 'Best estimate' scenario. Highlighted variables represent the only changes from the default settings.

**Table 6: Summary of model variables with default settings**

variable	'Left behind' world scenario	Best estimate or default setting scenario	'Aspirational' world scenario
<b>supply gains</b>			
annual gains from inactive workforce	0.01	0.01	0.01
annual gains from new graduate supply			
graduate supply 2016 – 2020	0.01	0.01	0.02
graduate supply 2021 - 2025	0.02	0.01	0.05
annual immigration gains from Australian trained graduates			
Australian trained pharmacist immigration 2015 – 2019	0.01	0.01	0.01
Australian trained pharmacist immigration 2020 - 2025	0.01	0.01	0.02
annual immigration gains from overseas trained pharmacists			
immigration of overseas trained pharmacists 2010 - 2015	0.4	0.4	0.1
immigration of overseas trained pharmacists 2016 - 2020	0.02	0.02	0.08
immigration of overseas trained pharmacists 2110 - 2025	0.01	0.01	0.04
<b>supply losses</b>			
annual loss from active workforce	0.03	0.03	0.03
annual loss from retirement			
short term 2010-2013	0.01	0.01	0.01
medium term 2014-2019	0.03	0.03	0.03
long term 2020-2025	0.01	0.01	0.01
annual loss from death & disability	0.002	0.002	0.002
annual loss through Migration Overseas	0.02	0.01	0.01
<b>community demand</b>			
population Growth	High (A)	High (A)	High (A)
productivity of dispensing process:			
ratio of dispensing technicians to pharmacists	0.4	0.3	0.3
dispensing Technician equivalence to a pharmacist	0.8	0.8	0.8
annual change in scripts per pharmacist completed	0.01	0.005	-0.01
annual change in scripts per person prescribed	0.005	0.005	0
% of primary health care services undertaken by pharmacists	0.01	0.02	0.05

variable	'Left behind' world scenario	Best estimate or default setting scenario	'Aspirational' world scenario
<b>hospital demand</b>			
age specific separation rates	Trend	Trend	Trend
ratio pharmacists / separations	Trend	Trend	Trend
limit on separations / pharmacists trend	Yes	Yes	Yes
annual change in separations per pharmacist	0.01	0.01	0.01
<b>demand for chronic disease programs</b>			
asthma - % GP asthma encounters at end	0.03	0.05	0.05
asthma - Hours / encounter	0.3	0.3	0.3
asthma - Community pharmacy %	1	1	1
diabetes - trend	1	1	1
diabetes - % GP diabetes encounters at end	0.01	0.05	0.05
diabetes - % of diabetes type 2	0.85	0.85	0.85
diabetes - Hours / encounter	0.3	0.3	0.3
diabetes - Community pharmacy %	1	1	1
<b>demand for medication reviews</b>			
RMMR trend	1	1	2
RMMR coverage	0.9	0.9	0.9
RMMR turnover	0.05	0.05	0.05
hours per RMMR	1.5	2	1.5
community pharmacy %	0.5	0.5	0.5
HMR trend	1	2	5
hours per HMR	3.5	3.5	3.5
community pharmacy %	0.5	0.5	0.5

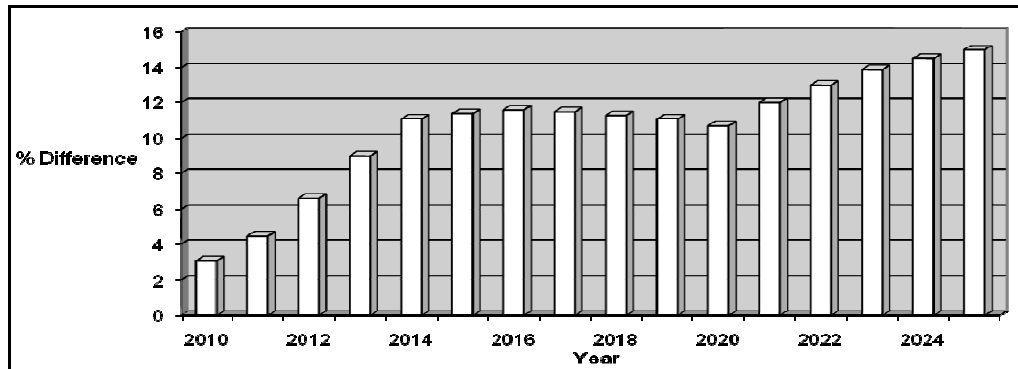
## Scenario outcomes

All the scenarios assume that total pharmacist supply and demand are in balance in 2006 (apart from some unmet demand in the public hospital services sector)<sup>xiii</sup>.

Between the years 2006 to 2025, under the '**Best estimate**' scenario outcomes, supply is projected to grow at a compound rate of 3.2% (adding 11,237 FTE pharmacists to the workforce), and total demand at a rate of 2.4% (adding 7,654 FTE pharmacists to the demand for pharmacist labour).

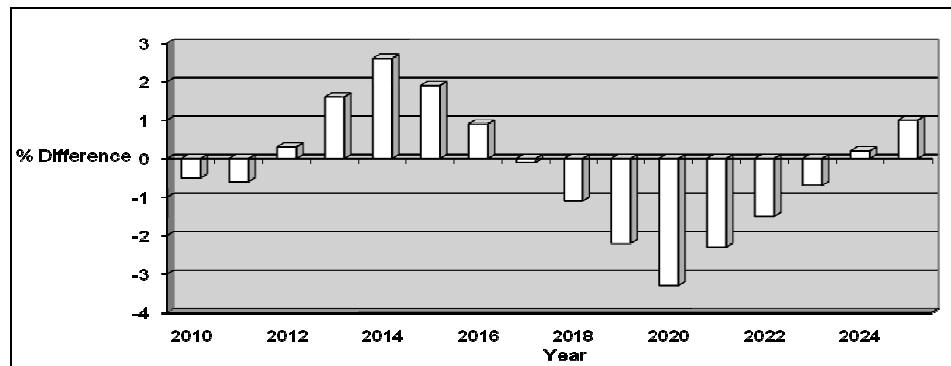
In the 'Best estimate' scenario a gradually increasing surplus of pharmacist supply is predicted which after 2014 creates a difference of greater than 10% between supply of and demand for pharmacist labour. This gap is not subsequently reduced and indeed increases further as demand growth after 2020 falls behind comparatively modest growth in supply<sup>xiv</sup>. The trend is shown in the Figure below.

**Figure 13: Projected difference between demand and supply as a percentage of supply between 2010 and 2025; 'Best estimate' scenario**



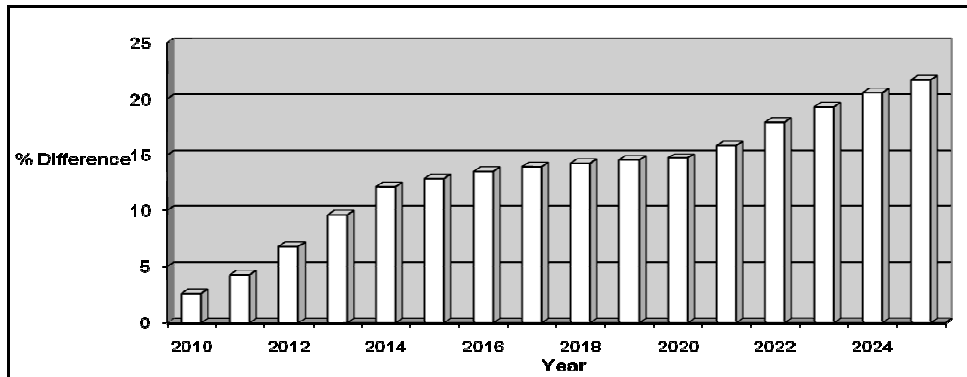
In contrast, the **Aspirational world scenario** shows a more finely balanced labour market where unmet demand or over supply of pharmacists is of little consequence. This is in spite of the fact that supply in this scenario is growing annually at a higher rate than for the 'Best estimate' scenario (3.7% versus 3.2% per annum). Growth in demand in this scenario is estimated to be 3.66% compound per annum, much higher than the 'Best estimate' scenario where growth in demand is [a lower but still healthy] 2.4% compound per annum. The percentage difference between supply and demand over the life of the planning period in the Aspirational world scenario is shown in the Figure below.

**Figure 14: Projected difference between demand and supply as a percentage of supply between 2010 and 2025; 'Aspirational world' scenario**



At the other end of the spectrum is the 'Left behind' world labour market scenario, which has a lower rate of growth in supply than the 'Best estimate' scenario (2.7% versus 3.2%) but has a significantly lower rate of growth in demand (1.5% compound growth per annum). This scenario produces a potentially large over supply of pharmacists throughout the planning period but especially by the end of the planning period by which time a 20% plus difference between supply and demand has emerged. This scenario would result in high unemployment or under-employment of pharmacists or else a large net wastage of qualified pharmacists from the pharmacy workforce into other occupations where some of the pharmacist's skills may be better remunerated. The percentage difference between supply and demand over the life of the planning period in the 'Left behind' World scenario is shown in the Figure below.

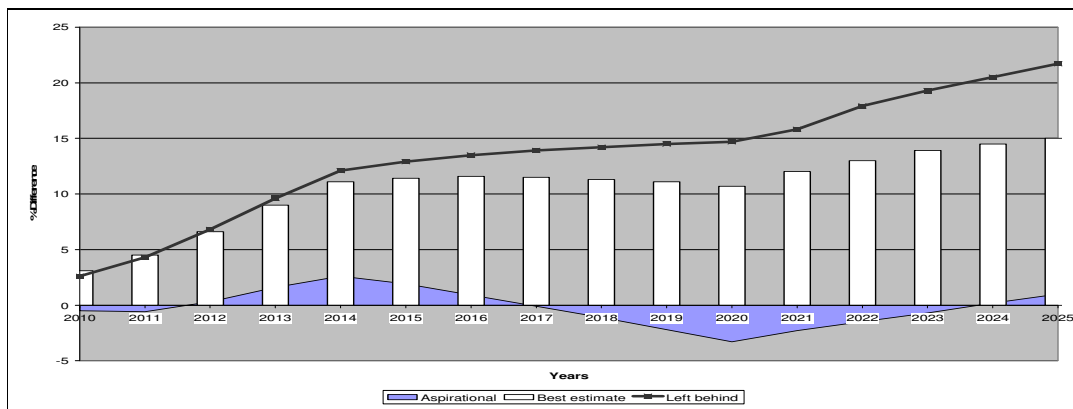
**Figure 15: Projected difference between demand and supply in percentage between 2016 and 2025; 'Left behind' world scenario**



The comparison of these three labour market scenarios shows how significantly different outcomes can be obtained through manipulation of a comparatively small number of variables (see Figure 16 below). The key variables, that is, those to which the outcomes are most sensitive, are the community demand variables. Outcomes are particularly sensitive to changes in the productivity of pharmacists (in the Aspirational world scenario for instance the productivity goes down as more time is actually spent on dispensing activity) and to growth in the demand for primary health care services (again, with the Aspirational world scenario there is maximum growth in this area allowable with the model).

A comparison of the three scenarios (Aspirational, Best estimate and Left behind) for projected percentage differences between supply and demand between 2016 and 2025 is shown in Figure 35.

**Figure 16: Comparison of three scenarios (Aspirational, Best estimate and Left behind) of projected difference between demand and supply in percentage between 2016 and 2025 . Positive % implies oversupplied labour market**

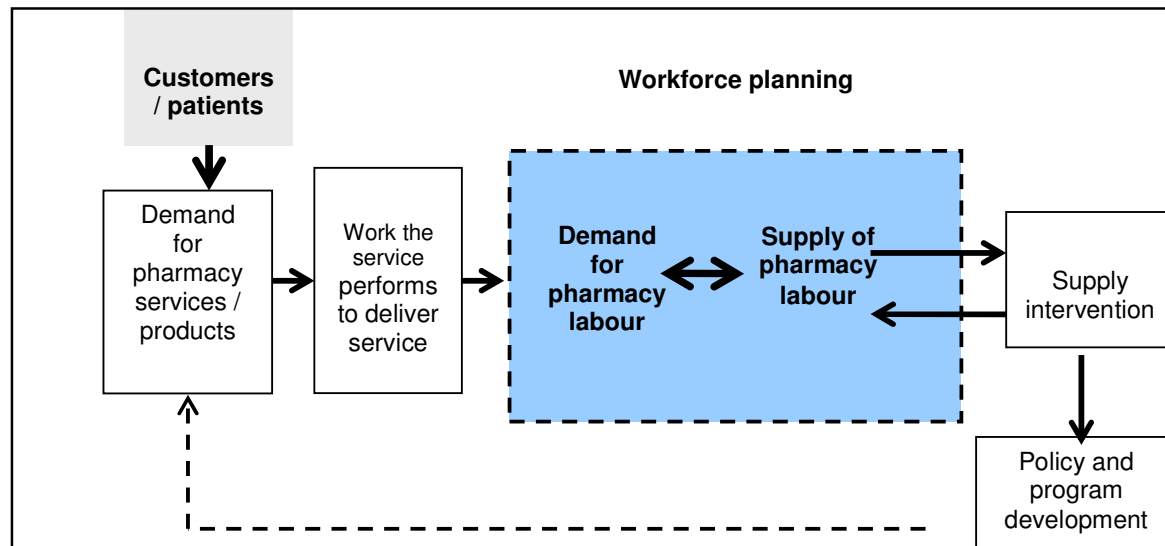


## Discussion of the scenario outcomes

The focus of discussion in any workforce planning exercise should be on the demand for services and then on the capacity of labour supply to not act as a limiting factor in the delivery of those services. This conceptual approach is illustrated in Figure 17 below.

The modelling approach adopted for this study follows this concept. Demand for labour is the key driver from a workforce planning perspective. Supply interventions **respond** to the demand generated, not the other way around. Demand for labour in turn is generated by demand for services.

**Figure 17: Conceptualisation of the demand and supply modelling**



The **‘Aspirational world’ scenario** provides the best example of a demand driven labour market approach. In this scenario the expectations of demand growth are bold and often at the limits of the model’s allowances. Demand growth would need to be supported by third party payer support (for instance the Commonwealth through Community Pharmacy Agreements) particularly in the areas of medication review and planned chronic disease programs and possibly too through greater support of longer, richer and more complex interactions with patients in the dispensing or dispensing related activity. It would also need to be supported by a change in the type of services and the way services are delivered within a broader ‘health services’ market. There is significant risk here that the market may not be interested in consuming these services, at least not from pharmacists.

Because the Aspirational world scenario is so demand driven, the capacity of pharmacist supply to support this growth is brought into question. A balance in this scenario is projected because high growth rates of supply are supported by continued trend growth in immigration of overseas qualified pharmacists and a moderate growth in new graduate supply. If this supply growth could not be sustained then a level of unmet demand might evolve that became intolerable. Since the bulk of the additional demand for pharmacists in this scenario is generated in the community pharmacy sector, it is likely that its needs for labour will be satisfied first and other labour market segments will find it difficult to compete. Thus, a return to high vacancy levels in hospital pharmacy services would be likely, and community pharmacies in less attractive locations (rural and remote regions, outer metropolitan areas) would again struggle to find pharmacist staff to employ.

The obvious response from a workforce planning perspective would be to dampen pressures for demand growth — this will happen anyway through market forces if growth in demand cannot be sustained by reasonable rates of growth in supply. However this would seem to be counter-productive. This scenario is termed ‘aspirational’ for good reason — it embodies all that most of the pharmacy profession would like to see in the future and gives life to the underlying visions of successive (and probably future) Community Pharmacy Agreements.

The **‘Best estimate’ scenario**, while not as optimistic as the Aspirational world view, still projects rates of growth in demand higher than at virtually any time in the past for the pharmacist workforce, higher than the total Australian workforce is likely to grow (or is capable of growing at least in the short term) and significantly higher than projected Australian population growth. And yet supply is still projected to be in surplus over most of the planning period, and towards the end of the planning period unsustainably in excess. Some might argue the over supply is at a level that is required to support a more organic, supply driven growth in demand, but this is difficult to support at levels of over 10% difference between supply and demand. The ‘Best estimate’ scenario lends some supportive evidence to those stakeholder interest groups who remain concerned about an impending surplus of labour supply to demand requirements and the impact this might have first on depressing the price of labour and then second on the attractiveness of pharmacy as an occupational choice.

The potential labour market problems associated with the 'Best estimate' scenario would seem to be comparatively easily resolved. Approaching this from the supply side (for instance putting in place measures to reduce growth in supply) would appear to be less desirable, and in any case less feasible to achieve. Growth in new graduate supply and immigration of Australian trained pharmacists is projected at historically low levels — many might argue unsustainably low — and therefore there is limited opportunity to further reduce growth. A more sensible approach would be to stimulate demand growth.

For argument sake, the adjustment of just two variables — reducing productivity increase per annum of community pharmacists from 0.5% to zero (that is not having any improvement in pharmacist's productivity over the life of the planning period but rather retaining productivity at a constant) and increasing the proportion of primary care services that pharmacists perform to 5% of the GP workload — brings demand and supply into almost complete harmony over the duration of the planning period. While a 'stand still' level of productivity may seem problematic, this effect could be achieved by investing productivity gains into higher quality or slightly more time spent with patients.

The '**Left behind world**' scenario delivers a labour market that is supply driven. Even with the comparatively modest growth in supply (in relation to past growth) of this scenario, a significantly over supplied labour market is still generated. Some might argue that the 'Left behind' world is most reflective of the situation that currently exists, indeed several stakeholders at the Search Conference argued just this case saying holding the *status quo* in terms of service delivery models and funding would inexorably produce a 'Left behind' labour market scenario.

A labour market so over supplied as that projected in the 'Left behind' world scenario would almost certainly see some level of un-or under-employment of pharmacists and an increased wastage rate. And yet, for reasons already discussed in relation to the 'Best estimate' scenario manipulating supply variables to reduce the growth of supply is untenable. So the best recourse is to consider stimulating demand.

Given the characteristics of the 'Left behind' world the options here too are less obvious, even though the need is greater since the gap between demand and supply is large. Since demand growth in the 'Left behind' world is dependent on growth in dispensing and dispensing related activity one response might be to minimise the substitution of pharmacists in the dispensing role, assuming that the business model of community pharmacy could accommodate this avenue especially if the dispensing fee was put under greater pressure. Another might be to try to maximise the support from third party payment sources for chronic disease management and fee for service type quality use of medicine or primary health care services.

Changing the ratio of dispensing technicians to pharmacists in the community pharmacy dispensary back to the default value (3 : 10), maximising the amount of work undertaken through funded asthma and diabetes chronic disease programs, and achieving significantly high growth than the current trend of growth rate in HMR services, brings the demand and supply growth patterns into closer trajectories but still leaves a close to 8% projected gap between supply and demand. Even with these adjustments, all made within the realm of the 'Left behind' world framework, the workforce size by 2025 is still considerably less than in the 'Aspirational world' scenario labour market (just under 20,000 versus nearly 26,000).

## Broad policy and program options

The above examples serve to illustrate how the model can be used to translate hypothesised pharmacy and pharmacy services worlds into tangible labour market scenarios and how feasible policy and management responses to these scenarios can be constructed and then tested for their capacity to resolve perceived and potential problems. In fact there are a broad range of variables impacting on pharmacy workforce demand or supply that can be feasibly influenced within or by the 'pharmacy industry'<sup>19</sup> or 'profession'. A summary of the options that can have the most impact follows.

<p><b>Policy approaches suitable to a projected labour market with unmet demand for pharmacists</b></p>	<p><b>Graduate supply</b></p> <p>If the desire is to increase growth of new graduate supply (for instance to support much higher levels of growth in demand), then perceived bottlenecks in the enrolment, training, graduation and transfer to the workplace must be addressed. Currently the greatest concern and most perceived limiting factor is clinical practice training opportunities both at the undergraduate and postgraduate level. A policy will need to be developed in particular on support for pre-registration training (a) in order to create more potential opportunities in non traditional settings and (b) to possibly support and encourage employers to take on the training / supervision responsibility by reducing their cost burden. Other health professions (medical practice, nursing) have already begun to face and address limitations in clinical practice opportunities and resources. Their experience may be usefully absorbed.</p>
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	<p><b>Competence of non professional labour</b></p> <p>Substitution of pharmacist labour with technicians or assistants currently is unstructured and in the community sector completely unregulated. To plan for substitution at a workforce level is difficult when there is no defined form of labour in terms of skills and knowledge to substitute. This undermines pharmacist claims for uniqueness and a considered place within the primary health care system when unqualified labour can perform some of their functions. One respondent to the Search Conference findings summarised the issue well:</p> <p><i>"[If] ... "non-professional" people are to be counted in the pharmacy workforce I would like to see some criteria placed around inclusion. At the moment training program outcomes and competencies are ill-defined and, when they are available refer mainly to retail, technical and administrative activities. There is no clearly articulated training program that enables these individuals to assist the pharmacist in the delivery of professional services. They are [thus] only facilitators for sales and prescription throughput."</i></p> <p>If non professional labour is to substitute for pharmacist labour when the unmet demand is truly for pharmacists, then this labour must have a higher level of skill. A policy direction could be to ensure minimum competency standards are regulated at least for the dispensary technician / assistant role. Some states require a single relevant unit of competence from the Community Pharmacy Training Package. The full Certificate III / IV qualification from the Health Training Package would be a more appropriate standard, and one that is fairly uniformly applied in the hospital pharmacy setting where in certain prescribed contexts high levels of substitution have proven possible.</p>
	<p><b>Loss from the workforce</b></p> <p>Reducing losses of pharmacists through a range of human resource strategies could be fertile policy development ground. In a study of attractive workplaces in Victoria (Ridoutt and Santos, 2005) creation of challenging and satisfying jobs was found to be a high value policy direction. In community pharmacy this may mean supporting a larger and more diverse range of possible roles including in outreach pharmacist services from hospitals and clinics, independent consultant pharmacists and pharmacists employed in primary care and general practice networks. These initiatives may be especially important in rural areas.</p> <p>Losses of non professional staff from community pharmacy are extraordinary high, making any effort to impose more training requirements on this workforce a poor investment. The conditions of work and employment in community pharmacies need to be addressed to create more attractive workplaces with more interesting work. To the extent that it is possible, career pathways need to be considered, interesting and rewarding jobs / roles constructed, and employment conditions improved to reward higher competence and better outcomes. Hospital pharmacy settings appear to have achieved better retention outcomes.</p>
<p><b>Policy approaches suitable to a projected labour market with an over supply of pharmacists</b></p>	<p><b>Graduate supply</b></p> <p>If the desire is to reduce or at least contain enrolments, then limited control can be exerted by applying more rigorous accreditation requirements on new schools of pharmacy through the registration authority acceptance and endorsement of courses that will lead to pharmacist registration. Similarly, schools of pharmacy could be required to undergo regular quality audits, failing which schools could be dis-endorsed or required to limit enrolments until quality issues were addressed. A stronger set of course assessment and endorsement standards might also satisfy the many industry and profession stakeholder interests who are currently voicing concerns. Higher standards may create some workforce problems within the academic pharmacist workforce. This study was unable at such a micro level to determine if supply problems might already exist.</p> <p><b>Cognitive pharmaceutical services</b></p> <p>Pharmacists in community settings already provide a range of cognitive pharmaceutical services ranging from genuine value added to the dispensing process to primary health care services that may have no pharmaceutical component (Chapman, et al., 2009). Growth in cognitive pharmaceutical services in community pharmacy though in the current environment is most likely within what this study has term 'selected' services area, largely</p>

those services supported by government funding, not an immediate expansion of the existing unstructured (and largely unrecognised) services.

Within the 'selected' services area there is scope for growth since the current budget allocations are under-spent. Recent trends though are that program uptake is significantly on the improve, and budget constraints will begin to become a limiting factor on growth. Given that there will still be room to expand programs to cover more of an eligible population future growth may depend on the funding arrangements negotiated through Community Pharmacy Agreements.

If greater and faster uptake of the program is deemed appropriate then creating a more direct link between consultant pharmacists and general practice and the service funding might be advisable. In other areas of enhanced primary care service the most successful rate of program uptake has occurred in areas such as 'Better Access [to mental health services]' where individual practitioners or specialist companies have been able (and encouraged) to form direct and strong relationships with GPs. In the case of medicines reviews for instance, specialist consultant pharmacists whose primary source of income is cognitive pharmaceutical services are likely to be more aggressive in the services market than community pharmacists for whom the services may be a 'sideline' income source.

Another area of policy determination could be in relation to the general practitioner referral required to initiate some cognitive pharmaceutical services, especially HMRs. The approach taken to RMMRs might be adopted too for home medicines reviews, although well placed observers suggest that the best outcomes are indeed achieved even with RMMRs where collaboration between pharmacist and GP is strong. Perhaps the relationship could be structured such that *initiation* of services is more within the control of the pharmacist but *continuation* of a service requires a collaborative approach and be a part of a more comprehensive patient care plan. This would bring the medicines review process closer to other forms of enhanced primary care both operationally and in terms of financial arrangements.

## Primary health care

Many argue a new future for community pharmacy relies on it building a stronger understanding and adoption of the National Primary Health Care Strategy. Several stakeholders consulted during the study noted that the current (and past) Community Pharmacy Agreement is poorly linked with the National Primary Health Care Strategy. They were of the opinion that greater integration of hospital and community services would be a logical starting point. One stakeholder's comments illustrate:

*"The demand in the health care system is for patient care pharmacists. We should be looking at scenarios for the future of patient care pharmacy. To be considering a string of "cognitive pharmaceutical services" is silly. ... pharmacists are needed at all levels of the health system (primary, secondary and tertiary level care), in all settings (Hospital, community, aged care, urban, rural, remote) etc. Some will develop specialist skills based on the patient or community needs that they encounter in their practices."*

Growth of demand for pharmacist labour in the primary health care setting could be significant but the underpinning influences are weak and a deliberate and structured approach is required to ensure development progress appropriately.

Hospital pharmacists already seemingly occupy the type of space to which community pharmacy aspires, providing a range of professional services within a collaborative and multi-disciplinary team framework. The collocation and contiguous nature of acute care service delivery no doubt facilitate the emerging approach (compared with the more fragmented service delivery locations in primary health care). However hospital pharmacists have clearly made an attempt to deliberately engage when they could have remained siloed. Lessons from this setting could inform policy design.

Community pharmacies are the most accessible elements of all health infrastructure. The Government's commitment to enhancing the profile and importance of preventative and primary health care provides community pharmacy an opportunity to utilise its extensive community network and distribution capacity.

Pharmacist productivity, both in the community pharmacy and hospital setting, is an extremely powerful variable that can act to increase or decrease demand for pharmacists. Policy options that helped to increase pharmacist productivity, for instance support for *eprescribing* or more general communications technology support (for instance as part of the national broadband strategy) would effectively reduce demand. On the other hand, policy support for pharmacists spending more time in the dispensing function would increase demand.

## Conclusion

The model presented in this report provides a range of pharmacy stakeholders the opportunity to shape the future of the pharmacy workforce in support of whatever services delivery dream they might hold.

While the report has appropriately looked at the increasing demand for the supply of prescriptions in a growing and ageing population, with its attendant impact on the demand for labour, the report identifies a number of factors which will mitigate against the demand for increasing pharmacist numbers in this area of activity, including increasing use of non-pharmacist staff, automated dispensing machines etc.

The provision of professional pharmacy services is however not limited by such factors — what will determine this demand parameter is the willingness and capability of the pharmacy profession to undertake the dispensing role and a range of other services in a way that better utilises their skills and knowledge. It is here that major structural and financial arrangements will have the greatest impact on the role of pharmacy in health care delivery and therefore on workforce numbers, structure and indeed the future of the profession

Pharmacy services indeed are on the verge of an exciting and potentially rewarding period of growth. There is no reason why labour resources should place limitations on the direction or strength of that growth.

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## Appendix A: Study reports

During the course of the two years of the project a number of separate but related studies were undertaken to build an understanding of pharmacy workforce supply and demand variables. Each of these studies generated a report, some of which were published. The list of reports includes:

- a literature review of pharmacy workforce developments in Australia and internationally — Chen, T (2008) *Pharmacy Workforce Planning Study Literature Review*. Human Capital Alliance, Sydney.  
<http://www.humancapitalalliance.com.au/documents/Literature%20Review%2023102008.pdf>
- a feasibility study into longitudinal tracking of registered pharmacists to calculate wastage, and develop and evaluate retention strategies — Braddock, D and Summers, F (2008) *Pharmacy Workforce Planning Study: Feasibility Consultation Report*. Australian Institute of Health and Welfare, Canberra.
- case studies of 20 community and hospital pharmacies exploring the issues of non professional pharmacy labour — Ridoutt, L (2008) *Report on Non Professional Labour in the Delivery of Pharmacy Services (Review of case studies)*. Human Capital Alliance, Sydney.
- analysis of factors influencing the current supply of pharmacy labour and projections of future supply based only on secondary data sources - Ridoutt, L (2008) *Analysis of Secondary Data to Understand Pharmacy Workforce Supply (Initial Supply Report)*. Human Capital Alliance, Sydney.  
<http://www.humancapitalalliance.com.au/documents/Initial%20Supply%20Report%20final%20-%2022102008.pdf>
- analysis of factors affecting the demand for pharmacy labour, again based almost exclusively on secondary data sources, and projections of future demand — Long, M and Shah, C (2008) *Analysis of Secondary Data to Understand Pharmacy Workforce Demand (Initial Demand Report)*. Human Capital Alliance, Sydney.<sup>xv</sup>
- paper and discussions on the findings of the Search Conference — Freeman, O and Ridoutt, L (2009) *Report on the Search Conference: Where is Pharmacy in Australia Headed* Human Capital Alliance, Sydney.
- modelling the supply and demand of the pharmacy workforce — Long, M and Ridoutt, L (2009) *Workforce Planning Modelling Report*. Human Capital Alliance, Sydney.
- longitudinal tracking system feasibility study – Braddock, D and Summers, F (2009) *Non-practising and Non-renewing Pharmacists Pilot Survey Report*. Australian Institute of Health and Welfare, Canberra.

## Appendix B: Methodology overview

Most major workforce planning projects, and this project would qualify as a major effort, piece together a robust understanding of current and future demand much like a jig saw puzzle, drawing on a comprehensive range of inquiry approaches to gather the necessary information. The inquiry approaches planned for this study and for the most part employed were:

- A. Secondary data analysis — that is analysis of existing data sources where the data has been collected for purposes other than workforce planning. For instance data collected for administration of registration or for education and training purposes or for administration and tracking of payments under the PBS;
- B. Interviews with selected key informants — subjects from various stakeholder organisations were interviewed to gauge satisfaction with the methodology of the previous studies (especially where change is considered important) and seek guidance on the main influencing factors upon which to focus;
- C. A literature / document review — including all the Pharmacy Guild reports and other reports (including from overseas contexts) aimed at isolating major influences on pharmacy services / labour demand and understanding the impact of these various factors including the Community Pharmacy Agreements;
- D. A set of case studies — where carefully selected community and hospital pharmacies were studied and employment practices especially in relation to non professional staff examined;
- E. A large mailed survey questionnaire — administered to a sample of community pharmacies across Australia and all hospital pharmacy departments. A separate survey undertaken by the Society of Hospital Pharmacists Australia (SHPA) of hospital pharmacy services was also drawn upon for specific information;
- F. A search conference — at which the future of pharmacy services was explored especially the growth of professional or ‘cognitive’ services and the labour implications considered;
- G. A survey of registration authorities — to develop and implement a longitudinal tracking system of registered pharmacists to calculate wastage and to develop and evaluate retention strategies; and
- H. A series of focus groups and a final stakeholder workshop — to discuss the main findings of the draft report and to develop action-oriented draft recommendations.

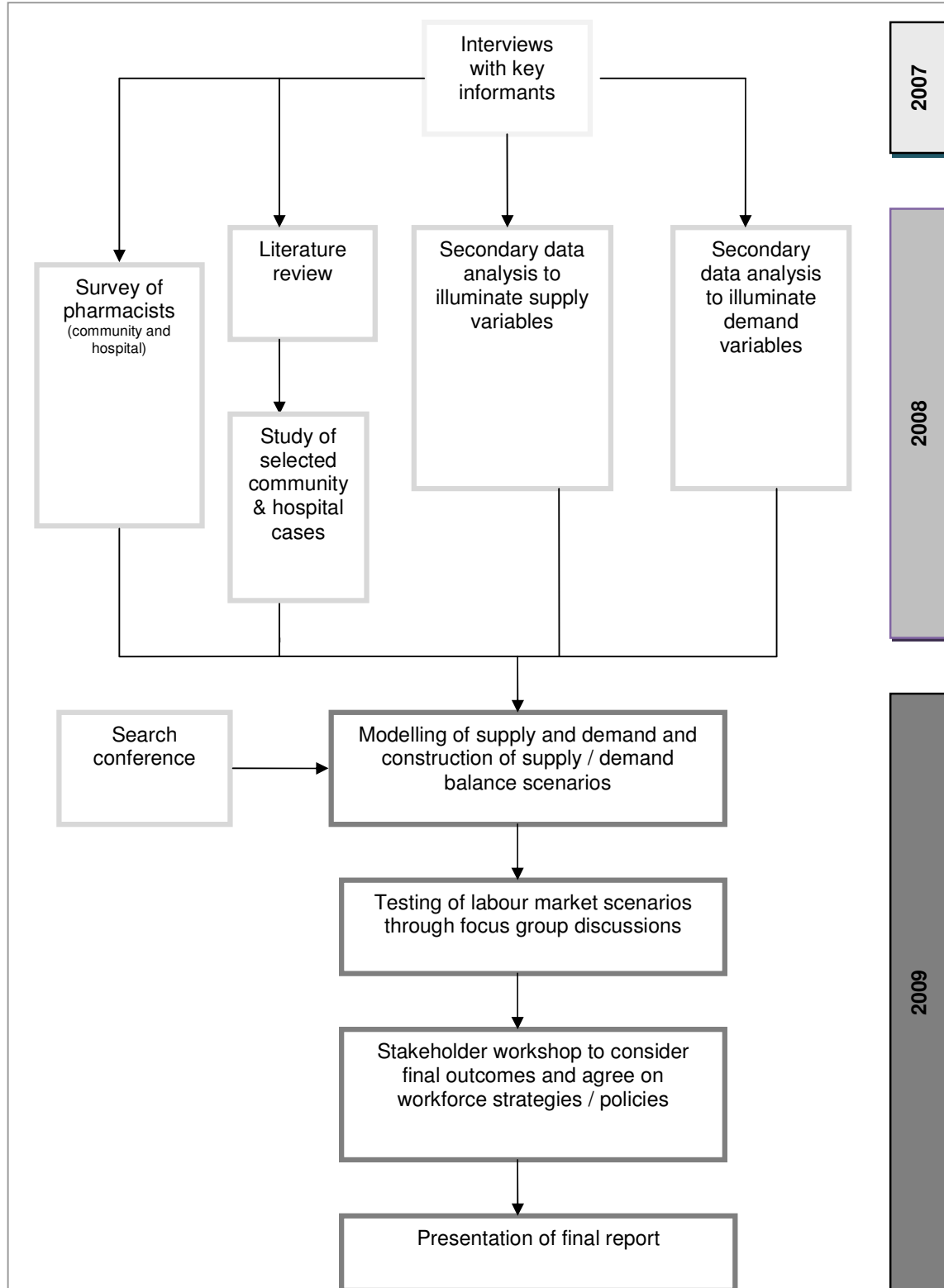
In the diagram below an attempt is made to show how these various forms of data collection and information development relate to specific study objectives — that is how the jig saw fits together to provide a complete picture.

**Figure B1: Matrix identifying satisfaction of objectives by process of inquiry**

Study objectives	Methods of inquiry							
	A	B	C	D	E	F	G	H
validate and refine the previous model (HCI, 2003)								
provide information about the current state of the pharmacy workforce								
identify, analyse and quantify factors that affect the pharmacy workforce								
identify opportunities for innovative intra and inter profession arrangements								
develop a ‘forecast’ of annual supply and demand for pharmacy workforce through to 2025								
consider issues to be addressed relating to balancing pharmacy workforce supply and demand								
develop and implement a longitudinal tracking system								

In the Figure below, the way these different methods of inquiry were implemented and how they related with each other both conceptually and temporally to provide interim deliverables and ultimately this final report is illustrated.

Figure B2: Overview of implementation of study methods of inquiry



## Appendix C: Opening the model

### Step 1:

You will most likely have received the tool via email. When you receive it you will need to decide where you would like to save it. We would suggest you create a separate folder since this will facilitate faster access each time you look for the model and will make for a more systematic storage of saved labour market scenarios generated through use of the model.

Once you have decided, save the attachment (from the email) to the place you have decided on (or to the folder you have created).

### Step 2:

The attachment will look like one of the following icons:



or



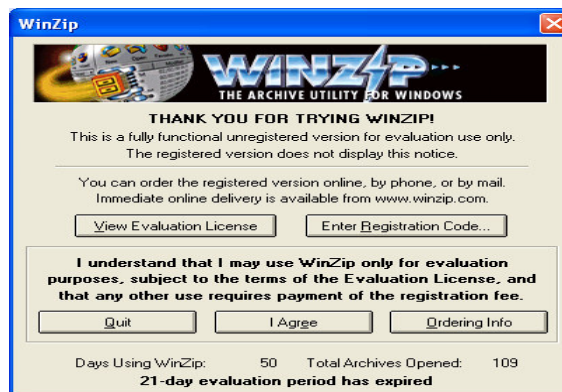
If your document looks like the first icon, the file is zipped and you will need to unzip it (see step 3) in order to be able access the file. If your document looks like the second icon it is an Excel file, simply double click on the document (wherever you have decided to save it) and it will open ready for use.

### Step 3:

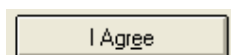
If the document is sent to you as a zipped file (see below icon) due to its size, in order to be able access it you must unzip the file.



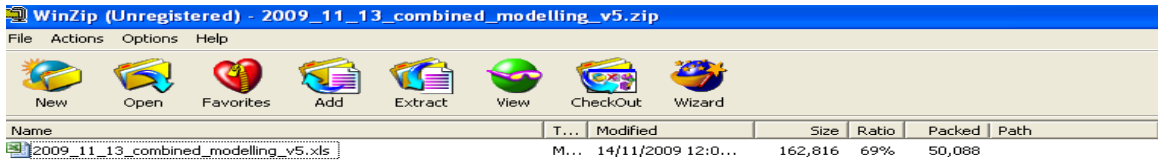
Double click on the file icon (as shown above). The file will open the Winzip screen as shown below (that is, assuming you have Winzip software installed into your computer).



Click on the 'I Agree' button as shown below.

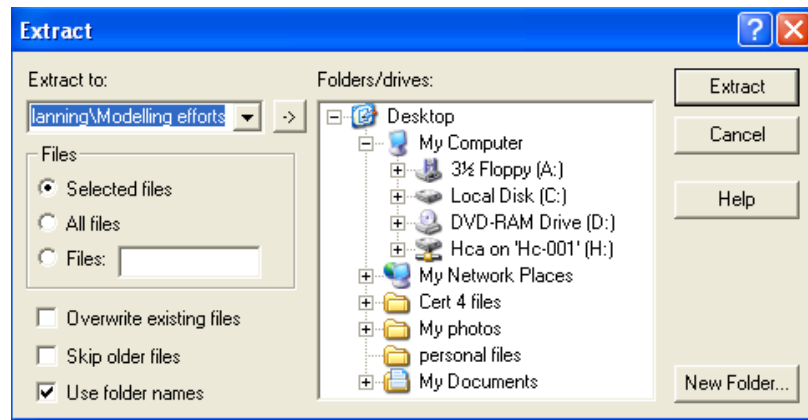


The file will then open to the screen as shown below:



Right click on the file as shown in the screen above and select the 'extract' option.

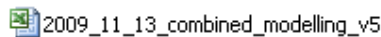
The screen shown below will open and you are then required to select where you would like to save the file on your computer. After you have selected the desired location, click on the 'Extract' button.



The database is now unzipped and saved on your computer, ready to be used.

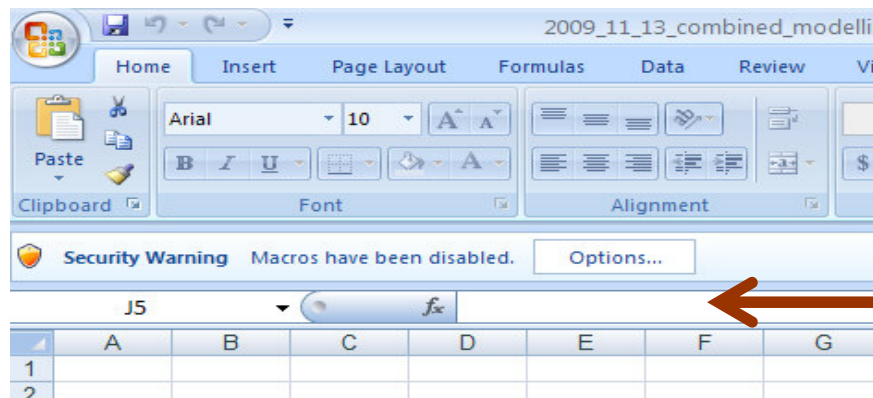
#### Step 4:

Go to where the tool is stored on your computer and double click on the icon.

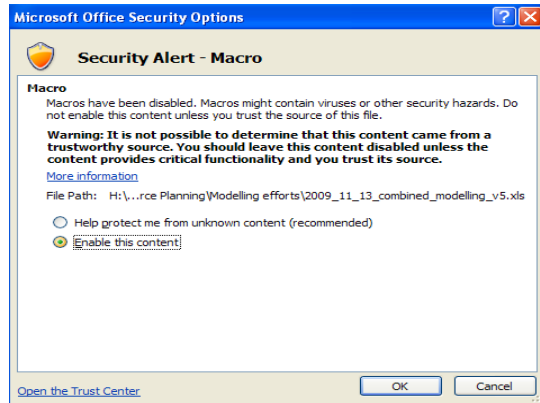


#### Step 5:

When opening the file you will see a security warning as shown in the screen below. Click on the 'Options' button.



The below screen will come up.



Select the 'Enable this Content' option and click 'OK'.

You have now opened the tool.

## Appendix D: Use of the model

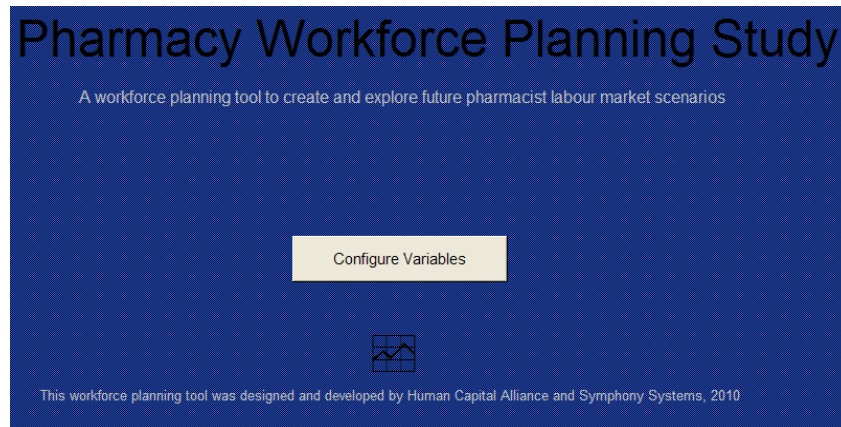
### Starting up

The model comes as a series of inter related Excel files with a programmed interface that makes the model simple to use. Setting up the model on individual computers is comparatively simple and described in Appendix C.

### Initial screens of the model

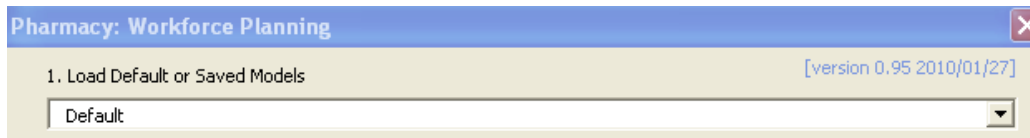
When the model opens you will see a 'Configure Variable' button as shown below. Click on it in order to begin using the tool or click the 'Start' button located in the bottom left hand corner of each page.

**Figure D1: model interface**



The tool will open to the screen shown in Figure D1 which is the main interface for accessing and manipulating all the variables of the model. To populate the cells in each variable open the 'Load default or saved models' (Figure D2) box and select 'Default'. The 'Default' settings are what the model considers to be the 'Best estimate' labour market scenario.

**Figure D2: Load or saved models**

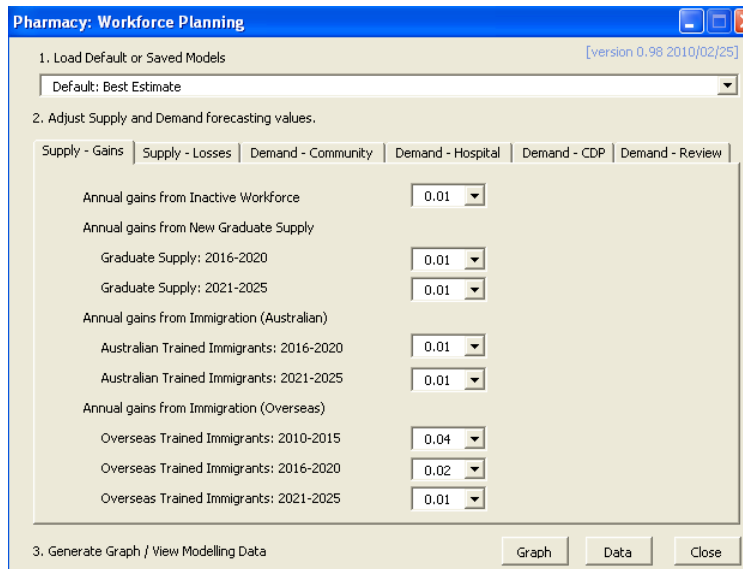


In the main dialogue box there are six tabs shown at the top of the screen. Two of the tabs ('Supply – Gains' and 'Supply – Losses') when clicked with the cursor will open and allow adjustment of supply side variables. The other four tabs open to allow manipulation of demand variables *viz.* demand for community labour in community pharmacies ('Demand – Community'), demand for labour in hospital pharmacy services ('Demand – Hospital'), demand from government funded chronic disease programs such as for diabetes and asthma ('Demand – CDP') and demand for labour the result of medication reviews ('Demand – Review').

### Constructing different labour market scenarios

All the variables across all six tabs have existing or default values. These values, as noted in the previous Chapter, have been set to what is considered to be a Best estimate. Each variable has a drop down range of value options that almost invariably take the 'Best estimate' default value as the median and offer alternatives that are lower or higher than the default value.

**Figure D3: Opening screen**



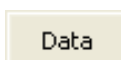
For instance the 'Annual loss from the active workforce' variable has a default setting of 3% (or 0.03) and the lower value options are 0.025 (2.5%) and 0.02 (2%), while the higher value options (that is greater annual rate of loss from the active workforce) are 0.035 (3.5%) and 0.04 (4%). For most variables the range of options is greater, but still within parameters that might by any reasonable observer be considered reasonable.

In the next Chapter the rationale underpinning each of the default 'Best estimate' settings is detailed and a guide as to how or why the values of each variable might change is provided so that the range of options can be used wisely. In the previous Chapter the advice was offered that constructing future labour market scenarios should be purposeful, based on a hypothesis of how different labour market variables will change, or how policy makers might want them to change. Each variable should be well understood before it is adjusted.

The model's calculations and outcomes can be generated at any time by clicking the 'Graph' button.



This gives the graph of projected total pharmacist supply and demand together for each of the years between 2006 and 2025. The actual figures for total supply and demand can be viewed by clicking the 'Data' button.



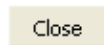
The data view for the default or 'Best estimate' labour market scenario is provided in Figure D4 below.

**Figure D4: Data view for 'Best estimate'**

Year	Supply	Demand
2006	12576.34	12575.52
2007	12746.74866	12931.49274
2008	12955.20258	13299.84708
2009	13288.32725	13686.64115
2010	13690.56256	14091.06354
2011	14163.80407	14596.0598
2012	14791.36366	15134.90622
2013	15511.26445	15684.37346
2014	16201.55051	16253.47646
2015	16927.45477	16800.72447
2016	17012.20737	17368.18528
2017	17390.90123	17966.93236
2018	17764.45939	18577.50653
2019	18133.75831	19205.7842
2020	18499.63202	19854.11478
2021	19232.86878	20524.62969
2022	19960.45622	21226.38801
2023	20683.29949	21939.4387
2024	21402.26972	22669.22098
2025	22118.20604	23417.05609

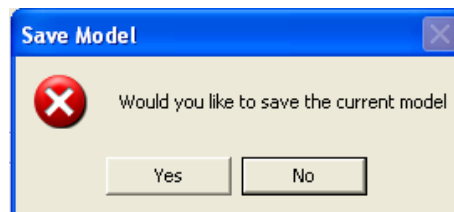
## Saving scenarios

Labour market 'scenarios' generated through selection and modelling efforts can be saved thus preventing the need to reconstruct the model each occasion of use. Close the document using the 'Close' button.



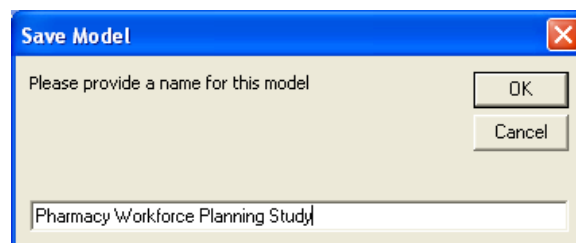
This will provide a prompt seeking whether you want to save the most recently constructed scenario or not. The prompt message is shown in Figure D5 below. Click 'Yes' if the desire is to save.

**Figure D5: Save model**



A name that makes sense to the user can be created in the 'Save Model' box as shown in Figure D6.

**Figure D6: Provide model name**



## Endnotes

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<sup>i</sup> There is some debate about whether this is in fact the most accurate estimate, an issue discussed in a later Chapter.

<sup>ii</sup> Because pharmacy services in Australia, much like other health services, are so heavily supported by government funding (for example through the Pharmaceutical Benefits Scheme [PBS]), 'price' has a limited role to play in modifying demand. An indirect form of 'price' influence occurs through the calibration of any consumer copayment on PBS payments.

<sup>iii</sup> Although the implications of the error are 'softened' by supply and demand starting equal in the base year.

<sup>iv</sup> It is not clear how some pharmacists not working in mainstream roles are classified by ABS. For instance pharmacists working in the public service, academia, or even in industry could be classified differently.

<sup>v</sup> All pharmacists working 38 hours or more counted as one one FTE, and all those working less than 38 hours per week counted as an FTE fraction.

<sup>vi</sup> There was a reduction in 1999 as it was the third year of the newly introduced four-year courses which started at most universities in 1997. There were still graduates from the University of Tasmania and Curtin University, and 'delayed' graduates from other universities who had failed units/subjects during 1998 and managed to complete their degrees in 1999. Contrary to a commonly held view, therefore, 1999 was not a 'fallow' year without graduates.

<sup>vii</sup> Note that the provisional 2009 statistics support this maintenance of this trend curve.

<sup>viii</sup> The term 'negatively influenced in this context is not necessarily pejorative. Indeed some may argue that slower dispensing completions signal improved pharmacy practice and bundles up more cognitive service delivery within the dispensing function.

<sup>ix</sup> This assumption, somewhat arbitrary in nature, is likely to cause consternation in some quarters because of the presumption that such a high ratio is associated with a 'cash and wrap' approach to dispensing.

<sup>x</sup> The actual relationship is likely to be more complex with declining marginal returns to the employment of additional technicians.

<sup>xi</sup> Some improvements in dispensing productivity may not necessarily be evident in changes in the ratio of prescriptions to pharmacists. For instance the quality of dispensing might improve (lower error rates, better packaging to assist compliance) even though the number of prescriptions dispensed per pharmacist is unchanged.

<sup>xii</sup> Note 46 weeks is inclusive of annual leave, public holidays, sick leave, etc.

<sup>xiii</sup> This is a difficult concept for most health professionals and policy makers to grasp since they are constantly dealing with labour markets that appear to be 'unbalanced', indeed typically displaying symptoms of chronic under-supply. However from a classical labour market perspective, and from the viewpoint of the modelling effort, at any point in time a labour market is technically in balance, that is the number of people employed is the number employers are willing to employ. 'Vacancies' of public sector employers are arguably a different case, but again for the purposes of modelling there are no easy ways of assessing and verifying 'vacancies' and it is simplest to accept a technical labour market balance at the commencement of the model period.

<sup>xiv</sup> One would imagine that with such sustained conditions of over-supply, growth from primary sources of supply (e.g. new graduates, immigration) would begin to decrease.

<sup>xv</sup> The 'Demand' report was of a highly technical and statistical nature, and as some time has elapsed since the 'Demand' report was written thus making parts of it now dated it was agreed between the researcher and the Advisory Panel that this report would not be made publicly available. The 'Demand' report has now been replaced by the modelling *the supply and demand of the pharmacy workforce* report and the final report.