Title: A work force model to support the adoption of best practice care in Chronic Diseases – A missing piece in clinical guideline implementation

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Abstract

The development and implementation of an evidence-based approach to health workforce planning is a necessary step to achieve access to best practice chronic disease management. In its absence, the widely reported failure in implementation of clinical best practice guidelines is almost certain to continue. The paper describes a demand model to estimate the community-based primary care workforce consistent with the delivery of best practice chronic disease management and prevention. The model takes a geographic region as the planning frame and combines data about the health status of the regional population, by disease category and stage, with best practice guidelines to estimate the clinical skill requirement or competencies for the region. The translation of the skill requirement into a service requirement can then be modelled, incorporating various assumptions about the occupation group to deliver nominated competencies. The service requirement, when compared with current service delivery defines the gap, or surplus in services. The results of the model could be used to inform service delivery as well as a workforce supply strategy.

Background

The ageing population and increasing rates of obesity mean that chronic diseases now represent a major health burden in most advanced societies, at an estimated 46% of global burden of disease and 59% of mortality [1]. Health is compromised when people with chronic conditions or with risk factors are unable to access the mix of health services they need to prevent or manage their conditions. The development and publication of best practice guidelines for the management of chronic diseases has been used by clinical research groups and governments to promote the adoption of best practice care. This has resulted in the publication of evidence-based clinical guidelines for most chronic conditions (see Box), developed according to defined protocols, (as specified for instance in the National Health and Medical Research Council (NHNRC) of Australia Guide to the Development, Evaluation and Implementation of Clinical Practice Guidelines [2].

Box 1: Proliferation of Clinical Practice Guidelines

Guidelines have been collected and displayed on internet websites including:

- Agency for Healthcare Research and Quality National Guideline Clearinghouse, USA- 2,097 guidelines, as at 27th June 2007.
- NHMRC, Australia - 46 guidelines, as at 29th June 2007.
- NZ Guidelines Group 2003 - 73 guidelines and reports as at 27th June 2007.
- National Institute for Health and Clinical Excellence- NICE (57 guidelines, as at 27th June 2007).
- the Guidelines International Network which has a collection of 4300 guidelines, systematic reviews and evidence reports available to members (GIN, 29th June) 2007)

The adoption of care defined by clinical best practice guidelines is widely regarded as desirable and the extent to which clinical practice conforms to best practice is one measure of health sector performance.

Despite the extensive publication and distribution of clinical best practice guidelines, there is ample evidence that large discrepancies between clinical care and best practice care persist and are associated with poorer health outcomes than achievable given the current

state of knowledge [3-6]. We suggest that the observed departures from best practice care reflect a failure in one or more of the three conditions/enablers:

1. *Sound knowledge of clinical practice guideline by clinicians* – This requires that guidelines are written in a way that is clear to clinicians and translatable into actions and an effective dissemination strategy;

2. A p*ractice environment supportive of delivery of best practice care* – there are potential barriers at the practice level under the control of individual clinicians and practice teams, including factors such as practice culture, habit, motivation, attitudes, inadequate time or priority accorded to clinical best practice care, lack of equipment/infrastructure, or pertinent administrative processes.

3. *A service system consistent with the delivery of best practice care* – Important system level attributes, outside of the control of the clinician or practice, influence clinician and patient behaviour. These include financial incentives (payment arrangement for clinicians and user charges on consumers), quality audit/quality assurance and accountability arrangements and a health workforce with the pertinent skills and competencies to deliver best practice care.

Most of the literature on implementation of clinical practice guidelines (CPGs) is focused on individual clinician or practice level approaches to changing clinician behaviour - the first 2 conditions above; [7-10]. Typical are the National Primary Care Collaboratives which seek to improve clinician's knowledge of CPGs but also support their implementation in primary care settings through culture change at the practice level [11]. Despite such initiatives, the quality of primary care does not conform to CPGs, particularly in the more disadvantaged communities [12-14].

It is postulated that without simultaneous attention to system issues, clinician and patient efforts to adopt best practice care will continue to falter. Examples of initiatives at the system level currently being pursued include the introduction of information technology (IT) systems into general practice, incorporating clinician decision support systems. This is likely to be most effective where combined with patient enrolment as we find in the UK and New Zealand. Supportive funding models and quality assurance mechanisms are also critical. These are also receiving increasing attention [6, 15, 16]. What has received little attention to date is the workforce implication of best practice guidelines. Access to a

suitably skilled workforce is a necessary condition to the delivery of and access to best practice care. The health workforce is a key system factor that must be in place to support the delivery of best practice care. Because of the large involvement of governments in the funding and delivery of health care and the joint control over training and accreditation by governments and professional bodies, it is not a simple matter of assuming the 'market will respond' to supply the appropriate mix of skilled practitioners.

This means that the delivery of best practice care requires a complementary workforce strategy. In this paper we describe a health workforce model designed to address this issue, to estimate at the regional level the health workforce that would support the delivery of best practice care. The focus of the model is on the occupations and professional groups that are responsible for the delivery of competencies crucial to the prevention and management of chronic diseases in the primary care setting. This includes allied health disciplines, community nursing and medical, covering both current and emerging occupational groups.

Methods for estimating the desired level of health workforce are not well established. Little has been published on the economic 'market' for allied health competencies and the implied demand for particular occupational groups, – either in relation to demand or supply (the generation of workforce capacity). Health workforce studies that exist, typically focus on the latter aspect, the supply of skilled health professionals, considering issues of recruitment, training, retention and career paths [17-19]. Other examples of supply side studies include an examination of allied health services by Queensland Health (2000)[20] focussing on factors that affect career satisfaction or by Boyce (2001)[21] focussed on allied health organisation structures.

There are fewer demand side health workforce planning models, which go back to a very early needs-based study of the medical workforce by Lee and Jones (1933)[22], a U.S. Department of Commerce (1978)[23] planning process for the nursing workforce and the GMENAC planning process for medical workforce in the U.S. (1981)[24]. The GMENAC process represents the largest scale example of a needs model. It was designed to establish the future requirement for medical specialists, with the process involving consideration of the medical conditions managed by each specialty group and the time commitment implied by agreed management protocols. The methodology was based upon a consensus approach, in which expert teams of clinicians agreed upon the typical/appropriate set of

tasks and treatments to manage persons with conditions relevant to each specialty. This, combined with an assessed prevalence of particular conditions was used to estimate desirable levels of specialists per unit of population.

The approach was found to be technically demanding. However, gathering and analysis of data using computations is a far simpler task today. It was also subject to two sets of criticisms. First, while demographic projections are relatively reliable, the assumptions concerning future technologies – the relationship between needs and service requirements – were more problematic. The 'fixed future technology' of the model did not allow for the possibility of factor substitution. This is a valid concern, but one that would apply to any competing model – such as historic ratios. Demand estimates would presumably need to be re-calculated on a regular, although in-frequent basis. Secondly, the approach was criticized, in the context of the US health system, as it was designed to project the need for health professionals, not the demand which would be revealed in the medical market place. However that criticism would not apply to the majority of health care systems where the market is not the dominant mechanism for allocating health care resources.

The wide-spread publication of best practice guidelines and progress in development of administrative data sets means a more objective basis for defining need and population health status is now possible.

There seems some confusion about the concept of 'demand' for health professionals. 'Demand' is often interpreted as the numbers needed to fill current positions – rather than the prior question of 'the number of positions required for best practice'. It is this question with which this paper is concerned. The Department of Human Services in South Australia (1999)[25], implemented a quasi-evidence based model in determining the allied health staff to deliver community-based diabetes care, within the 'Hills Mallee Southern' Region. The model relied on clinical and health services experts determining minimum skill requirements for the estimated population of the region with diabetes broadly based on best practice guidelines. This was translated into an EFT requirement and was used to negotiate staffing positions – taking into account budget constraints of the regional funder.

In general, approaches to health workforce planning (demand side) are highly simplistic. As noted by recent Government commissioned reports, health workforce models typically use either 'accepted' ratios (rules of thumb) of health workforce to population, 'expert

opinion' or 'expressed demand' service use plus waiting lists [26, 27]. While in a well functioning market, expressed demand might represent a valid approach, it is flawed in relation to health[28], precisely due to market failure which is the reason why workforce planning is needed in the first place.

Given the failure to locate in the literature a sound evidence-based model for estimating the health care workforce, we have developed such a model. The logic of the model rests on the value to society of generating a health workforce capable of delivering best practice care. Non-acceptance of that presumption would represent a direct challenge to the entire clinical practice guidelines/best practice care movement.

Methods: The need-based community-based health workforce model

The focus here in model development is on the sub-market of health professionals in their role in delivering community based services in chronic disease management and prevention. This focus reflects the importance of multi-disciplinary team care in that setting, the extensive development of evidence-based clinical practice guidelines to support best practice care, and accumulating evidence that best practice care of chronic diseases for management and prevention is also cost-effective (eg [29-33]). Combined with the typically fragmented nature of service delivery, mixed public private funding and incomplete knowledge by consumers of the effectiveness of health care, the skill mix will almost certainly be sub-optimal in the absence of a health workforce planning.

The model, describes a process for estimating the skill base required to deliver best practice care within a region, building on population health status and published best practice guidelines, translated into a service requirement in the context of the local service system. The model is similar to the SA model [25], but employing a more rigorous methodology and application. In implementing the model it is expected it would in the first instance be applied to selected health conditions, covering all pertinent skill groups and competencies; but ultimately extended across all health conditions managed in the primary and community care setting.

The model is illustrated in Figure 1 and described below. It includes a needs assessment task, a process for translating skills into a regional service requirement and for assessing the strategic and budget implications. It also incorporates formal feedback mechanisms.

A Needs assessment

Task 1 ***Scope*** – The scope involves selecting target health conditions and skill groups and geographic reach - national, state, regional level and/or local. The choice could reflect the importance of the health problem within the region (number of persons affected, loss of quality of life/loss of life, costs of management) and the importance of multi-disciplinary care in treatment and prevention. The selected health conditions suggest the pertinent skill groups and competencies that will need to be covered, which in turn suggest occupations to deliver the competencies. The principle is to scope occupations without regard to current regulatory and professional restrictions, to reflect capacity to deliver nominated competencies. In translation to a health service model scenarios can be developed which reflect alternative assumptions about relaxation of professional boundaries. The challenge in defining scope is to achieve a balance between the benefits of breadth of scope for example allowing for overlapping skills and approaches to management and increasing complexity of the health workforce planning task.

Task 2 ***Health status*** *of the study region* - Estimate the population with target chronic conditions and at risk, distinguishing sub-groups by severity of condition and prevalence of specific co-morbidities and pertinent socio-economic variables. The aim is to define sub-groups to match distinct management protocols; recognising constraints of administrative and other data sets.

Tasks 3 Define ***best practice*** *care*- Conduct a systematic review of published clinical best practice guidelines for target conditions and collate protocols, commenting on quality of evidence base, level of detail, capacity to distinguish sub-populations (including co-morbidities) and local applicability.

Task 4 ***Skill requirement*** *to deliver best practice care to each patient*- Interrogate the guidelines to describe distinct skills and competencies required to deliver best practice care for target condition(s). The aim is to estimate mean 'per patient' hours per year of care by each distinct skill type or competency for each distinct patient sub-group. Description of uncertainty intervals around these estimates would need to be described, and reflect a combination of random and non-random variation the latter capturing factors such as practice delivery models. A clinical expert group would assist in this task, using

established methods such as Delphi, nominal group technique (NGT) or consensus development conference approaches [34].

B Regional Services Requirement

Tasks 5 ***Total skill requirements*** *at the population level* – Patient level estimates derived under 4 are taken together with population heath status estimates derived under 2 to calculate the total person hours/year by skill and competency required to support best practice care within the case study region. Totals would require an allowance for non-patient related activities.

Task 6 Regional workforce ***service requirement*** – Translation of the estimated skill and competency requirement to a health workforce involves identification of the feasible professional options for delivering each distinct skill and competency. The options would be explored through modelling of plausible scenarios; such as altering the balance between specialist and generalist service providers. This task would be informed by evidence on effectiveness and cost-effectiveness of alternative professional delivery models (eg [35, 36]). A number of solutions will be described. However, it is expected that some will not be consistent with current professional boundaries – defined by regulation, training or professional practice.

C Strategic implications for budget and workforce supply

Task 7 Workforce implications by ***matching against current supply*** – *C*ompare workforce demand as described by the regional workforce service estimate arising from task 6 with information about the current workforce. Consider the nature of the imbalance and possible strategies to meet skill needs, in the short, medium and long term. Consider specifically implications for education and training including career paths.

Tasks 8 Budget or ***resource implications***– Translate workforce demand estimate from task 6 into a regional workforce budget by applying standard wage rates and on-costs. Consider possible mix between public and private provision and public and private funding.

Tasks 9 & 10 ***Monitor, review and adjust*** - The model would need to be dynamic and respond to new clinical and service delivery information. A plan for the required frequency of revision should be devised based on characteristics of the region, condition and nature of the evidence base.

In Box 2, the model is further explained by describing it in the context of diabetes.

Box 2: Description of workforce model applied to type 2 diabetes.

1. & 2. ***Scope*** *and* ***health status*** *of the study region: D*iabetes selected as the target health condition. Establish health status (epidemiology) of regional population, reflecting an understanding of diabetes and protocols for prevention and management by interrogating available data sets; (for example as listed in Table 2). Describe number of persons with diabetes type (Type 2, Type 1, gestational) by disease stage - recently diagnosed, with specific co-morbidities (vision impairment, neuropathy, foot problems, renal failure, heart disease) and persons at risk (eg combinations of IGT, obesity, previous gestational diabetes, high risk ethnic groups, aged over 50).

3. Define ***best practice*** *care:* Document clinical best practice for management of diabetes by type of diabetes and identifiable disease stages - highlighting the role of various skills. For persons with recently diagnosed NIDDM, describe optimal care over say 5 years – in terms of consultations with diabetes nurse educator, podiatrist, dietitian, physical activity specialist; conduct a similar exercise for persons with specific complications and for persons at risk.

4. Translate best practice protocols into ***skill requirement*** *per person* - for the newly diagnosed diabetic, persons with specific co-morbidities and complications and persons at risk. Express as mean hours by allied health skill/person/year at each disease stage, ie hours/persons for S_{a1} to $S_{ai.}$ ..... S_{n1} to S_{ni} W here: S_{ai} -is skill type a (eg dietetics) for population subgroup i (eg person with newly diagnosed NIDDM).

5. Translate mean hours into an ***EFT skill requirement*** *for each skill type* – (podiatrist, dietitian, diabetes nurse educator etc.), by combining mean hours for each skill type per person per year with estimated numbers in each diagnostic category
Multiply (S_{a1} to... S_{n1}) x H_1 ..... to ($S_{ai.}$ to S_{ni}) x $H_{i.}$
Where Hi is number of persons in disease category/stage
Adjust for typical contact hours per occupational group to arrive at EFT requirement.
Consider whether aim is to achieve best practice care or 'acceptable' care – and what this might mean.

6. & 7. Translate skill requirement into a ***service requirement*** *and* ***match against current supply*** – by taking results from step 5 together with local knowledge of allied health workforce, opportunity for multi-skilling or specialised care, geography of region, distribution of population, possible approaches to program delivery, nature of the client population. Compare with current skill mix and service structure.

8. Establish ***budget implications*** - Determine funding level required to support the projected service requirement. Compare with current resourcing levels. Consider how funding might be split between levels of government and program area. Consider balance between private and public funding.

9. & 10. **Monitor, review and adjust**. Create a plan for frequency of revision and adjustment based on nature of evidence for diabetes and characteristics of the region.

Implementation issues -data

Despite the pace of construction of clinical guidelines there are still gaps in the available evidence. This will impinge on the capacity to implement the workforce planning framework across all health conditions, given the reliance on published clinical practice guidelines. On the other hand, increasingly, standard data collections can be interrogated to meet other information requirements of the model. An example of pertinent data sources for Australia that can be used to determine population health status are listed in Table 1. The ability to implement the model in a way that is truly evidence–based cannot be established in principle, but only in the context of a specific application.

Discussion

There are important **c**onceptual and technical challenges of model implementation that are discussed here.

Summation of service needs across conditions - Because of the possible overlap between conditions and management, given common co morbidities, it is preferable that all chronic conditions are included in a single workforce planning exercise. Regardless of scope of the exercise, it will be important to adjust for the fact that some services will address more than one disease/health condition.

The existence of comorbidities is not only pertinent in terms of possible synergies in components of management, it may also influence approaches to management. For example a high proportion of persons with Type 2 diabetes, also have Coronary Heart Disease (CHD), CHD risk factors, or serious mental health problems (See for instance, [37, 38]). Psychiatric co morbidities not only represent a health problem to be managed, but they may impact on the ability of individuals to comply with recommended care (for both the psychiatric condition and their other comorbidities). This suggests the need for alternative, more intensive approaches to management [39].

Diagnostic criteria: 'The Clinical Iceberg' - There is considerable scope for imprecision in estimating the numbers of people with particular conditions. Typically chronic diseases (including CHD, hypertension, and type 2 diabetes) as well as risk factors occur across a range of severities. As the disease or risk factor becomes milder, the frequency becomes greater. As described in the model, in estimating the population health status, numbers

will need to be estimated for various sub-populations - such as those at risk, those with single conditions and those with comorbidities. Categorisation by disease stage and severity will also be important. Ideally, subgroups should be defined, wherever there are differences in the optimal approach to management and prevention. The problem is that the number of people identified with a condition depends not just on population characteristics but also on diagnostic criteria, which are necessarily somewhat arbitrary. Thus the distinction between the general population, persons 'at risk' and those 'with established disease' can be indeterminate, changing with the understanding of the disease and with known interventions for prevention, ameliorating symptoms or modifying disease progression. For example, the level of blood cholesterol predicts the risk of ischaemic heart disease mortality, rising across the entire range of cholesterol levels in the population, and therapeutic reduction in those levels by diet and/or drugs reduces the risk. Thus defining a population with high cholesterol is somewhat arbitrary.

Application of the model will also depend on the nature of available data sets from which sub-population estimates will be derived.

Variability in client needs - In interpreting clinical practice guidelines and translating these into a skill and competency input required for individual management, the varying needs of client sub-groups would need to be considered. This covers not just those with distinct co morbidities as discussed above, but also persons from specific cultural or socio-economic groups. Variable time inputs required for the effective management of clients with differential risk and different capacities to respond to care should be allowed for. There is potential for this to be ignored if modelling is unduly focused on the typical client.

Another issue is whether the health workforce model even if successfully implemented will impact as hoped for on quality of care. While service levels derived from the model are designed to ensure that all persons with nominated conditions are able to access best practice care, this does not ensure demand by patients reflects their level of need. This will depend on service characteristics - such as accessibility, perceived quality, cultural relevance and cost to the user and patient characteristics. Thus even if such a workforce planning model were implemented and translated into services, there could still remain a mismatch between demand and need. Promoting an understanding of best practice guidelines and promoting appropriate use of services would still be required. This

understanding would not just be about staffing and services but also about appropriate settings.

Furthermore, the strength of the underlying evidence base will vary between guidelines, as will the incorporation of considerations of cost effectiveness. Both factors will impact on patient outcomes even if guidelines are successfully implemented as intended.

As noted in the description of the model, how the skill requirement is translated into a service model and staffing requirement will depend, in part, on views about the relative role of specialist and mainstream/generic service delivery providers. This decision will be informed by matters such as published evidence, the service philosophy, the size of the region, capacity to attract specialist and generalist staff, the mix of conditions included in the health services planning exercise, views about critical mass and professional development, adequacy of the training of health professionals and capacity to allocate time between competing pressures.

Conclusion

While undoubtedly there are important practical and theoretical issues still to be explored, unless the service system has the skill-base to deliver best practice care, no amount of guideline development and dissemination will result in best practice care. Given distortions in the market for health care and restrictions on health workforce supply, it is highly unlikely that the normal market mechanisms will resolve the health labour force question in a way that will support delivery of best practice care. We propose an evidence-based workforce model informed by best practice guidelines and regional data to determine the primary health care workforce.

While there are undoubted challenges in the implementation of the proposed model, it should provide a better basis for workforce planning than commonly used highly simplistic methods. The model will also provide information about the gap between the current skill-base and that required for evidence based practice, which will highlight priorities for change and also inform key health care reforms and education and training policy.

Conflicts of interest

The authors declare that they have no competing interests

Author's contributions:

LS designed the model, conceived its application to chronic disease and drafted the manuscript. KD contributed to model design and helped to draft the manuscript. All authors read and approved the final manuscript.

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Figure 1 Allied Health Service Planning Framework and Tasks

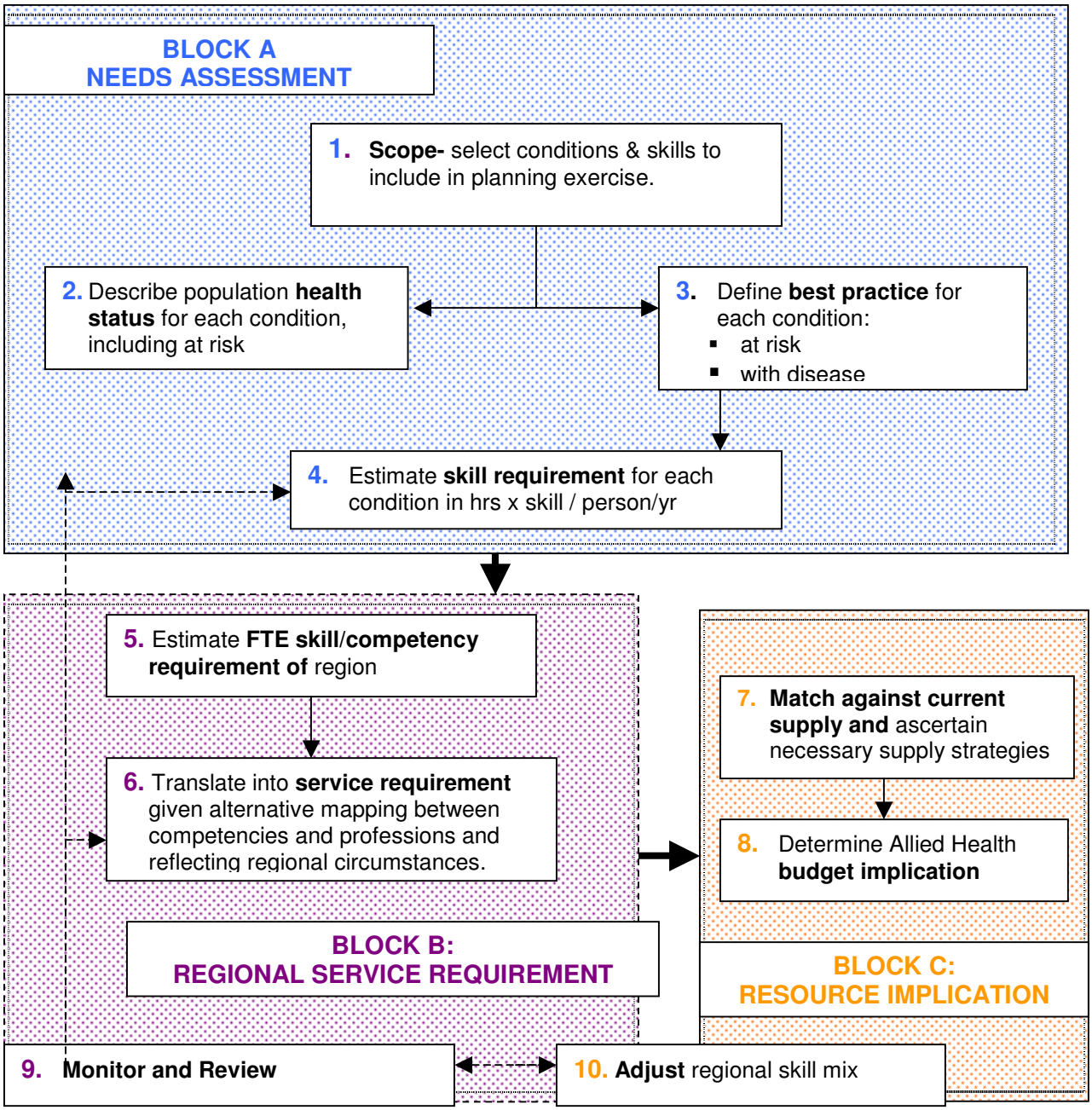

Table 1 Example of Australian Data Sources that might be used to establish health status of regional population

Routine National Surveillance Data	
Census data	Age, gender, socio-economic index, ethnicity etc.
Morbidity and Mortality	National Death Index, Burden of Disease Studies[40]
Regular surveys	National Health Survey, ABS Cause of Death statistics etc.
Administrative data sets	
Hospital data bases	Inpatient minimum datasets, Outpatient minimum datasets
Medicare data	Medical services MBS (Medical Benefits Schedule) on-line data,
	Prescription pharmaceuticals PBS (pharmaceutical benefits schedule) on-line
Specialist insurers	Veterans Affairs, Transport Accident, WorkCover etc.
Disease/condition specific, cohort data	
Disease Registers	Diabetes, Cancer, joint replacement register
Special Surveys, including cohort studies	Screening surveys; Region specific, eg Busselton, Dubbo Record-linkage studies etc.
Primary care data sets	Divisions of general practice; Primary care collaboratives

Note: Full references to all data sources available through correspondence with authors

Additional files provided with this submission:

Additional file 1: segal and dalziel_workforce manuscript.enl, 71K
http://www.implementationscience.com/imedia/2553455511657694/supp1.zip