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The Mismatch between Australian Population and General Practice Medical Workforce

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Authors' Contributions

TB conceived, designed, and acquired data for the study from the Australian Department of Health and Ageing and Australian Bureau of Statistics websites. TB and PG conducted the analysis, completed Tables and graphs and the interpretation of data and their clinical applications. TB, WM and LH analysed data and checked data and content of study. WM and LH proofread, corrected and suggested ways of improving the study. TB, WM, LH and PG read and agreed to the final manuscript for publication.

Research Article

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ABSTRACT

Aims: To review and analyse Australian general practitioner's workforce data for the 2000 to 2010 period by comparing this to Australian population trends and to make informed recommendations about GP workforce planning.
Study Design: Descriptive analysis of the available Australian government data on GP workforce and the Australian population between 2000 and 2010.
Place and Duration of Study: Griffith University, Australia, between April and November 2011.
Methodology: Australian GP workforce data for the 2000 to 2010 period was obtained from the Australian Department of Health and Ageing (DoHA) website and population data was obtained from the Australian Bureau of Statistics website. A descriptive analysis of workforce trends using variables of interests such as overseas trained GPs, gender, age,

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professional services during the 11 year period was compared to population trends data. A new GP Workforce Index ratio (GPWIR = No. of GPs <35yrs ÷ No. of GPs 35yrs to 64yrs of age) was derived from the data and calculated for each year of the study period.
Results: The ratio of female to male GPs has increased by 35% and the percentage of overseas graduates has increased by nearly 35% in the 11 year period, an indication that the 0.12% number of GPs as a percentage of Australian population between 2000 and 2010 was only sustained by increasing the intake of foreign trained graduates. Vocationally registered GPs have increased by 20% in same period. The GP workforce index ratio (GPWIR) decreased from 0.223 in 2000 to 0.118 in 2007; this was followed by a slight increase from 0.120 in 2008 to 0.128 in 2010.
Conclusion: The impact that an increase in the number of female GPs graduating from medical schools may have on the overall number of GP services available to the Australian population requires further study, since it was noted in the literature that female GPs are more likely to work part-time than male GPs. The GPWIR may be a useful indicator for evaluating the proportion of the <35yrs old GPs as a proportion of overall GP workforce. Lower GPWIR may be associated with GP workforce shortage. GPWIR increased in the last 3 years of the study corresponding with an improvement in GP supply. In this study, the GPWIR proved to be more effective in predicting overall National GP workforce shortage trend than the DoHA GP per Population ratio of 0.71:1000 (Primarily used for regional and rural workforce shortage prediction). The Department of Health and Ageing may need to keep supporting rural and remote migration of GPs and also maintain an increase in the number of students entering medical schools.

Keywords: General practice; workforce; gender; aged care; GP shortage; overseas trained GPs; Australian general practice workforce.

1. INTRODUCTION

The Australian population has grown significantly over the last eleven years to a current population of over 22 million; an increase of over three million new Australians (Australian Bureau of Statistics (ABS), 2011). It appears that while the GP workforce might have grown correspondingly alongside the Australian population demands it might not be accommodating the needs and complexity of specific patient groups such as the aged care sector in terms of GP services. In the late 1980s and 1990s, the perceived surplus of doctors by the Australian government led to a decision to reduce the intake of medical students into Australian universities and to introduce immigration points' deductions, Australian Medical Council quota and access restrictions for overseas trained doctors (Birrell, 1995). This approach contributed to a worsening GP workforce shortage in the late 1990s and early 2000s that required the reversal of such policies.

The Australian Department of Health and Ageing (DoHA) defines a shortage of doctors as the ratio of full-time equivalent (FTE) doctors to patients of less than 0.71:1,000 = 1:1,408 (DoHA, 2005). With increasing or decreasing numbers of doctors, this ratio could indicate 'over' and 'under' supply of doctors respectively. In Australia, workforce shortages are mainly experienced in regional rural and remote areas, as well as outer metropolitan areas in capital cities (DoHA, 2005). The ratio of doctor to patients is likely to be much worse for older Australians living in aged care facilities where there has been a reported fall-off in GPs

providing medical care for residents (Joyce and Piterman, 2008). An example of this is a recent survey of Catholic nursing homes whereby two-thirds had difficulty accessing GPs for residents (Catholic Health, 2010).

1.1 Areas of GP Workforce Shortages

The primary reasons for the supply imbalance of doctors in many countries include over-concentration of medical specialists but not enough primary care providers, and a disproportionate number of the healthcare workforce employed in urban areas (World Bank, 1993). The main GP workforce issue is not only how many GPs per population is required, it is also the distribution of GPs across the population and to various regions, as well as the unique requirements of settings such as aged care. The distribution of GPs throughout Australia is indeed uneven. In 2004, there were over 329 GPs per 100,000 population in major cities, 133 per 100,000 in outer regional areas and 95 per 100,000 in very remote areas (AIHW, 2006). However, these statistics do not take into account the increasing number of older Australians with multiple chronic and complex medical conditions that require experienced GPs who can spend time to treat such patients satisfactorily.

The effect of the GP shortage in aged care facilities is even worse in rural, remote and regional areas where residential aged care facilities (RACF) are more likely to transfer patients to hospitals due to insufficient numbers of GPs to service the facilities (Catholic Health, 2010). However, transferring patients to hospitals subsequently increases the workload on rural and remote GPs as most rural and remote hospitals are serviced by local GPs or locums (ABC, 2010). The problem is worsened by the shortage of other allied health practitioners with minimal role extension and overlap for busy GPs (Brooks et al., 2003; Kilpatrick et al., 2007; PC, 20005; AIHW, 1998).

1.2 Commonwealth Programs and Initiatives

Programs such as the Commonwealth or federal government's 'District of Workforce Shortage (DWS)'[1] and the states or territories 'Area of Needs Program (AON)'[2] (DoHA, 2008) were constructed to address the redistribution of doctors. Although these programs are important they cosmetically address the problem rather than fix it. Doctors who entered into these programs are mainly from overseas and usually have agreed to a moratorium of 3-10 years of 'forced' services depending on the remoteness of location of the practice. These doctors cannot practise in city locations until such moratoriums are completed (RACGP, 2009; NSWRDN, 2011). Some locations are poorly prepared in receiving these doctors into rural placement and the doctors may arrive to find they work much longer hours than expected. Also, there is the potential for some of the new recruits to experience culture shock and suffer adaptation problems in these new environments. Furthermore, in situations where the migrant doctor has children, there can be the tension of needing to move to an urban location for the children's education needs. These temporary programs therefore offer only short term solutions.

[1] District of Workforce Shortage: *Any location where there is a lack of doctors, including hospital based doctors, or where there are medical positions that remain unfilled even where recruitment efforts have taken place over a period of time.*

[2] Area of Need: *A geographical area of Australia in which the population's need for healthcare has not been met.*

However, foreign-born overseas trained doctors can offer numerous benefits to host countries and they are often recruited to fill the gaps in local medical workforce supply. The greatest benefit is that they are generally more flexible and willing than Australian born doctors to practice in less popular workplace settings. These may include less favorable working conditions such as night shifts, and certain geographical areas such as the rural areas that are avoided by Australian born doctors (Bundred and Levitt, 2000).

1.3 GP Workforce and Residential Aged Care Sector

Previous studies have shown that RACFs were increasingly relying on older male GPs in the provision of services (Lewis et al., 2002). Such a trend can only worsen the workforce situation as these older GPs retire and there are insufficient younger GPs to replace retiring GPs (Lewis et al., 2002; Charles et al., 2006). The proportion of RACF services provided by GPs younger than 35 years reduced from 19.2% in 1984 to 4.5% in 2000. On the other hand, GPs aged 45 years and over were increasingly servicing aged care facilities. GPs aged 45 years and older made up 58.1% of all RACF GPs in 2000, compared with 41.4% in 1984 (Lewis et al., 2002).

Of importance are potentially negative influences on the motivation of GPs to work in aged care. Examples include but are not limited to the complexity of care for older people with multiple chronic medical conditions, including conditions not frequently seen in everyday general practice and requiring extra time that some younger less experienced doctors may struggle to cope with (O'Halloran et al., 2007). Time consuming processes such as completing paperwork requirements for patients at the RACF, and also quite often, unnecessary and time consuming, transportation of clinical data make visits to RACF time-consuming and leave GPs with little time for contact with the patients (Gadzhanova and Reed, 2007). Furthermore, inadequate clinic facilities as well as low numbers of geriatric trained nurses add to the complexity of GP practice in RACFs (Hsu et al., 2005).

Remuneration for services provided by GPs to RACFs are limited by the cost and timing of transportation to and from aged care facilities. The current arrangements for general practice RACF services are seen as ineffective, lacking in outcome oriented medical standards, and less well remunerated than other services (AMWAC, 2005; Gadzhanova and Reed, 2007; Draper, 1999).

Furthermore, female GP RACF services as a proportion of all RACF services increased from 8.9% to 15.9% between 1984 and 2000, but the average number of RACF services per female GP declined by 15.6% services per year. In contrast, the average number of RACF services per male GP increased by 11.2%. This trend might be related to female GPs typically preferring practice-based consultations involving the clinical management of acute conditions and younger patients, and working fewer hours than male GPs (Britt et al., 2000; AMWAC, 1997). As there is a greater proportion of women among the younger GPs this will put more pressure on the GP workforce, if they continue to favour working fewer clinical hours than male GPs (Charles and Valenti, 2004).

1.4 Workforce Planning and Policies

Although the poor workforce planning and policy decisions in the 1990s have recently been replaced by an increase in university places for medical students the ageing of the GP population and their subsequent reduction in work hours, or retirement, will not offset the current trends for an ageing Australian population (Britt et al., 2009). There has often been

poor co-ordination between Ministries of Health, universities, training institutions and the progressive increase in the demand of the population, and this has only compounded the GP shortage problems (Alwan and Hornby, 2002). There is a need to review workforce data in order to be able to make informed recommendations about workforce planning. This paper reports on Australian GP workforce data for the 2000 to 2010 period and compares this to Australian population trends: It is hypothesis that a mismatch or disparity existed between the Australian population and the number of GPs available in Australia in the year 2000 to 2010 period. The progressive increase in the Australian population may not be matched by a corresponding increase in the number of GPs. This in turn could lead to shortages in GP primary care services and in particular to residential aged care services, home visits, and after hours' services.

2. METHODOLOGY

Data collection and analysis: The DoHA website was accessed to download up-to-date General Practice Medical Workforce data and Australian population data was obtained from the Australian Bureau of Statistics website for a period of eleven years from 2000 to 2010. These data were coded according to financial year starting from the 1st July of each year and ending 30th June of the subsequent year.

Classifications of data were completed according to Department DoHA classifications: (1) Overall national figures of GPs, (2) GP gender split group, (3) type of GP, (4) age groups and (5) place of basic training. GP workforce data and population data were compared yearly over the eleven-year period. Further data classification was not possible due to the constraints within the source data as the data were limited to classifications as above. A possibility is the fact that DoHA analysed this data according to relevance and cost and therefore this limited the scope of the available data.

A simple descriptive analysis of the DoHA data was conducted to evaluate differences and similarities between each individual year of the study from 2000 to 2010.

In this study, the DoHA classification groups were defined as follows:

Overall GP national figures according to the (DoHA, 2011) data source was divided by using:

a) Headcount figures (revised series) were generated using Date of Service (DOS) data compiled 2 months past the end of the reference period (DoHA, 2011).

b) Total services include all services that were claimed by GPs (not just services for GP items) (DoHA, 2011).

The following categories were presented in the DoHA data:

1. GP gender split group: The Male versus Female number of GPs for each year between 2000 to 2010.

2. Types of GP: There were three types of GPs used in this study based on their recognition by Medicare Australia for vocational registration:

(a) The Vocationally Registered GP (VRGPs) as pre-defined by DoHA data used in this study are GPs who have completed their GP fellowship training and have obtained a College Fellowship from either Royal Australian College of General Practitioners (RACGP) or the Australian College of Rural and Remote Medicine (ACRRM) and have being recognized by Medicare Australia for vocational registration (RACGP, 2010).

(b) The Non-VRGPs are GPs who have not completed or obtained a fellowship of either RACGP or ACRRM and are also not recognized by Medicare Australia for vocational registration (RACGP, 2010).

(c) GP registrars are doctors who are specifically undergoing training to become GPs. This is a special type of non-VR GPs differentiated by the fact that they are in a specific training program recognized by Medicare Australia to become GPs (RACGP, 2012).

3. GP age groups: The GP age groups of<35yrs; 35-44yrs; 45-54yrs; 55-64yrs; 65-74yrs and>75yrs were pre-defined by the DoHA data. There was no access to the individual age of GPs from the provided information.

4. GP place of basic training: This was divided into two groups: GPs who trained in Australia and GPs who trained overseas (In any other country apart from Australia).

In view of the fact that the Australian Department of Health and Ageing (DoHA) defines a shortage of doctors as the ratio of full-time equivalent (FTE) doctors to patients of greater than 0.71:1,000 (DoHA, 2005) with increasing or decreasing numbers of doctors, this ratio could indicate 'over' and 'under' supply of doctors respectively. This study sort to clarify the usefulness of this ratio in predicting GP workforce shortage by evaluating the trend over the eleven-year period.

This study also considered the impact of the dwindling or reduction in the number of younger GPs<35yrs of age as a ratio of other GPs in active workforce age groups between the age of (35yrs to 64 yrs) according to the DoHA data. An initial analysis of the DoHA data according to this ratio indicated a possible trend in the reduction of the ratio according to workforce trend. A new GP Workforce Index ratio (GPWIR = No. of GPs<35yrs ÷ No. of GPs 35yrs to 64yrs of age) emerged as a result of this initial assessment and was then calculated from the GP workforce data. The GPWIR trend was then compared to the DoHA ratio of 0.71:1,000 for each year of the study.

Accordingly, relevant Figures and Table were then generated from the DoHA data in presenting the results of this study.

3. RESULTS

3.1 Descriptive Statistics

The population of GPs in Australia increased from 23,147 in June 2000 to 26,613 by June 2010, an increase of 15% (DoHA, 2011). In the same time period, the general Australian

population increased from 19,153,380 in June 2000 to 22,328,847 by June 2010, a population increase of 3,175,467 people; an increase of 16.6% (ABS 2003; ABS 2008; ABS 2011). The GP/population ratio decreased from 1:827 in June 2000 to 1:839 by June 2010 (All GPs who have provided at least one Medicare service during the reference period), such that there were more people per GP in 2010 than in 2000. In percentage terms, the total number of GPs as a percentage of the Australian population fluctuated from 0.121% in 2000 to 0.114% in 2004, and increased again to 0.119% by 2010. This increase has been maintained at an average of 0.12% of the Australian population over this time-period (Fig. 1).

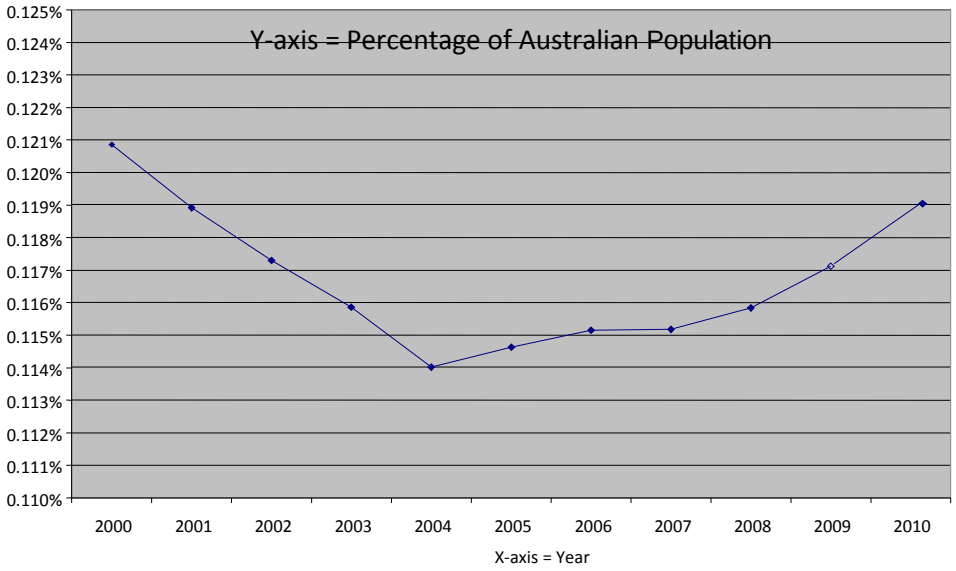

Fig. 1. GPs as percentage of Australian population (by year)

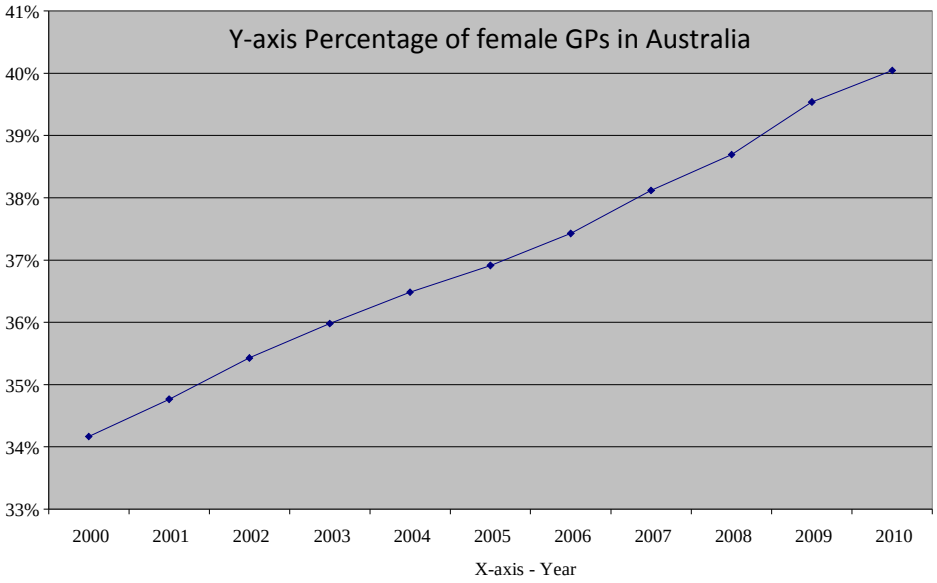

Fig. 2. Percentage of female GPs in Australia (by year)

Furthermore, the percentage of female Australian GPs has increased steadily from 34% of the GP population in 2000 to 40% in 2010, an increase in terms of the actual number of female GPs of 35% (Fig. 2).

In that same time span the population of male GPs has remained relatively stable with a modest increase of 5% over 11 years. In ratio terms, the ratio of female to male GPs has increased from 0.52:1 in 2000 to 0.67:1 in 2010. However, there were more male GPs than female GPs for each year of the study (Fig. 3).

The number of GP Registrars increased from 956 in 2000 to 1,721 in 2010, an increase of 80%, and the number of vocationally registered GPs increased from 17,409 in June 2000 to 20,922 by 2010, an increase of 20%. In contrast, the number of non-vocationally registered GPs decreased from 4,782 in June 2000 to 3,970 in 2010, a decrease of 17%. In terms of age group, over the 10 years from 2000-2010 the number of younger GPs (<30yrs) decreased by 30% while those in the 55-64 year age group increased by 96% and those in the 65-74 year age group increased by 43%, consistent with fewer young GPs being available in 2010 than in 2000 to replace older GPs (Fig. 4).

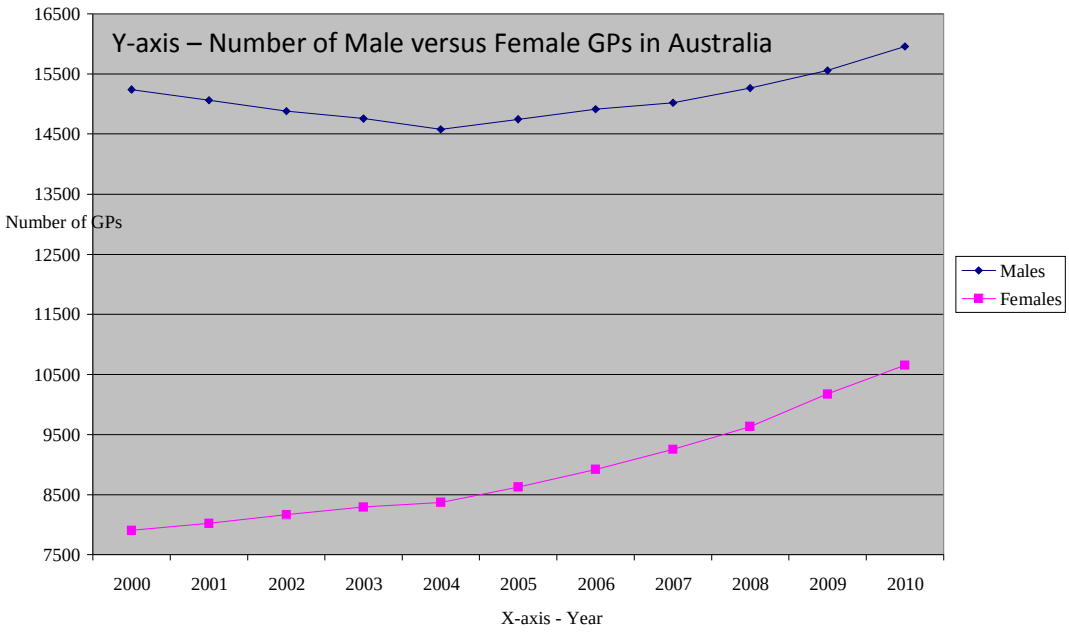

Fig. 3. Number of male vs. female GPs in Australia (by year)

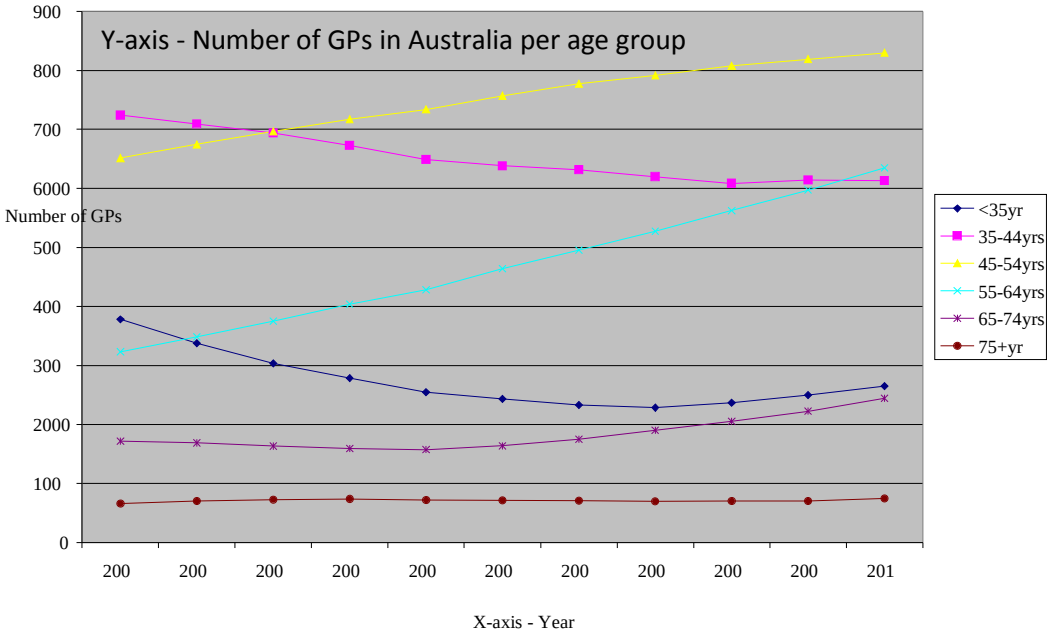

Fig. 4. Number of GPs in Australia per age group (by year)

3.1 GP Workforce Index Ratio (GPWIR)

A new GP Workforce Index ratio (GPWIR) was introduced to aid in the evaluation of the decreasing number of GPs<35 years of age over the study period. The GPWIR was defined as the ratio of GPs<35yrs old divided by number of GPs 35 to 64yrs of age (Active working age of GPs over 35yrs of age).

Table 1 below compares the DoHA GP: Population ratio of 0.71:1000, which was adjusted to decimal point of 1 GP per population of 1:1,408 and for easier interpretation, the data was reported with DoHA adjusted ratio of 1:1,408. This was then compared to the GPWIR for each eleven year of the study period between 2000 and 2010.

The GP workforce index ratio (GPWIR) decreased from 0.223 in 2000 to 0.118 in 2007; this was followed by a slight increase from 0.120 in 2008 to 0.128 in 2010.

On the other hand, the DoHA GP: Population ratio of 0.71:1000 adjusted to 1 GP per population = 1:1,408, did not indicate a national workforce shortage over the eleven years as all the years had lesser than 1, 408 people to one GP.

The (GPWIR) may therefore be a better national monitoring ratio of the number of GP trainees<35yrs graduating and entering the workforce as an indicator GP workforce shortage with decreasing or increasing number of younger GPs<35yrs over the eleven year period.

Table 1. The yearly calculation of GP Workforce Index Ratio

Year of service	Number of GPs in Australia according to age group	GPs <35yrs	Number of GPs in the: (Most Active Working GP age groups = 35-64yrs)	Overall number of GPs IN Australia	Number of (Full Time Equivalent GPs (FTE)	FTE GPs to population ratio (DoHA ratio of 0.71:1000 adjusted to 1 GP per population = 1:1408)	GPWIR = <35YRS ÷ Most active working GPS age groups (35-64yrs)
June 2000	<35 YRS = 3783; 35-44 YRS= 7239 45-54 YRS = 6511 55-64 YRS = 3234 65-74 YRS = 1715 >75 YRS= 665 TOTAL = 23147	3783	16984	23147	13874	1: 1381	3783/16984 = 0.223
June 2001	<35 YRS = 3375 35-44 YRS= 7094 45-54 YRS= 6744 55-64 YRS= 3484 65-74 YRS > = 1685 >75 YRS= 703 TOTAL = 23085	3375	17322	23085	13972	1: 1389	3375/17322 = 0.195
June 2002	<35 YRS = 3038 35-44 YRS= 6934 45-54 YRS= 6966 55-64 YRS= 3753 65-74 YRS > = 1633 >75 YRS= 726 TOTAL = 23050	3038	17653	23050	14119	1: 1393	3038/17653 = 0.172
June 2003	<35 YRS = 2786 35-44 YRS= 6727 45-54 YRS= 7169 55-64 YRS= 4038 65-74 YRS > = 1594 >75 YRS= 737 TOTAL = 23051	2786	17934	23051	14166	1: 1405	2786/17934 = 0.155

June 2004	<35 YRS = 2547 35-44 YRS= 6490 45-54 YRS= 7335 55-64 YRS= 4282 65-74 YRS > = 1576 >75 YRS= 719 TOTAL = 22949	2547	18107	22949	14246	1: 1413	2547/18107 = 0.141
June 2005	<35 YRS = 2433 35-44 YRS= 6379 45-54 YRS= 7569 55-64 YRS= 4642 65-74 YRS > = 1642 >75 YRS= 713 TOTAL = 23378	2433	18590	23378	14509	1: 1406	2433/18590 = 0.131
June 2006	<35 YRS = 2332 35-44 YRS= 6315 45-54 YRS= 7773 55-64 YRS= 4956 65-74 YRS > = 1748 >75 YRS= 710 TOTAL = 23834	2332	19044	23834	14789	1: 1400	2332/19044 = 0.123
June 2007	<35 YRS = 2285 35-44 YRS= 6196 45-54 YRS= 7916 55-64 YRS= 5274 65-74 YRS > = 1904 >75 YRS= 697 TOTAL = 24272	2285	19386	24272	15133	1: 1393	2285/19386 = 0.118
June 2008	<35 YRS = 2368 35-44 YRS= 6081 45-54 YRS= 8077 55-64 YRS= 5625 65-74 YRS > = 2050 >75 YRS= 702 TOTAL = 24903	2368	19783	24903	15532	1: 1384	2368/19783 = 0.120

June 2009	<35 YRS = 2499 35-44 YRS= 6144 45-54 YRS= 8187 55-64 YRS= 5968 65-74 YRS > = 2227 >75 YRS= 701 TOTAL = 25726	2499	20299	25726	16045	1: 1368	2499/20299 = 0.123
June 2010	<35 YRS = 2649 35-44 YRS= 6131 45-54 YRS= 8298 55-64 YRS= 6346 65-74 YRS = 2446 >75 YRS= 743 TOTAL = 26613	2649	20775	26613	16482	1: 1355	2649/20775 = 0.128

(GPWIR = GPs <35yrs old ÷ Most Active Working Age GP Groups (Defined as GPs aged 35-64yrs old).

In that same time period, on average, the percentage of overseas trained Australian GPs increased steadily from 25.4% in 2000 to 34.5% in 2010 (Fig 5).

Locally trained Australian GPs increased from 17,259 in 2000 to 17,422 in 2010, an increase of 1% while the population of overseas trained GPs increased by 56% from 5,888 in 2000 to 9,191 in 2010 (Fig. 6) and overseas trained GPs provided more services per person (No. of services/No. of GPs) than Australian graduates: Overseas Trained: Australian Trained = 5.1:4.3 in June 2000 and 5.8:4.3 in June 2010.

An increase was also noted in the ratio of overseas trained to Australian trained GP. This trend may indicate that Australia is increasingly relying on International Medical Graduates to fill the shortfalls in GP workforce in Australia. Consistent with the above, on average, 85% of GP services rendered were provided by GPs of between 35 yrs. and 64 years of age (Fig 7 below).

In year 2000, the total number of GPs in Australia was 23,147, and the total number of services provided by these GPs was 105,047,000. Therefore, in year 2000, GPs provided in average 4,538 services per 1 GP. Similarly, in 2010, the total number of GPs in Australia was 26,613, and these GPs provided a total of 126,950,000 services. Therefore, GPs provided in average 4,770 services per 1 GP in 2010. In summary, GPs provided more services in 2010 per 1 GP than in year 2000.

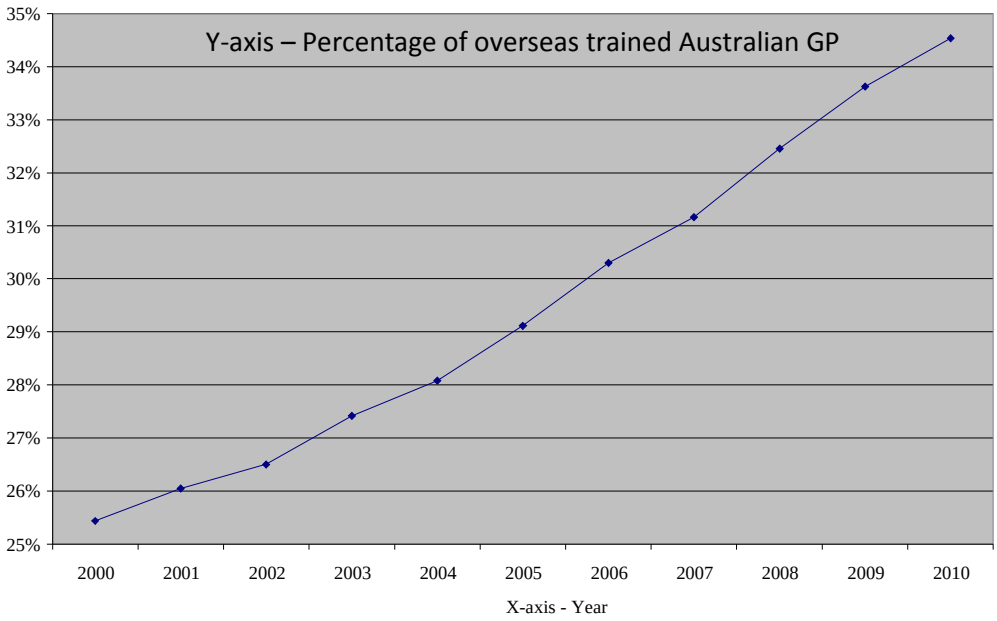

Fig. 5. Percentage of overseas trained Australian GPs (by year)

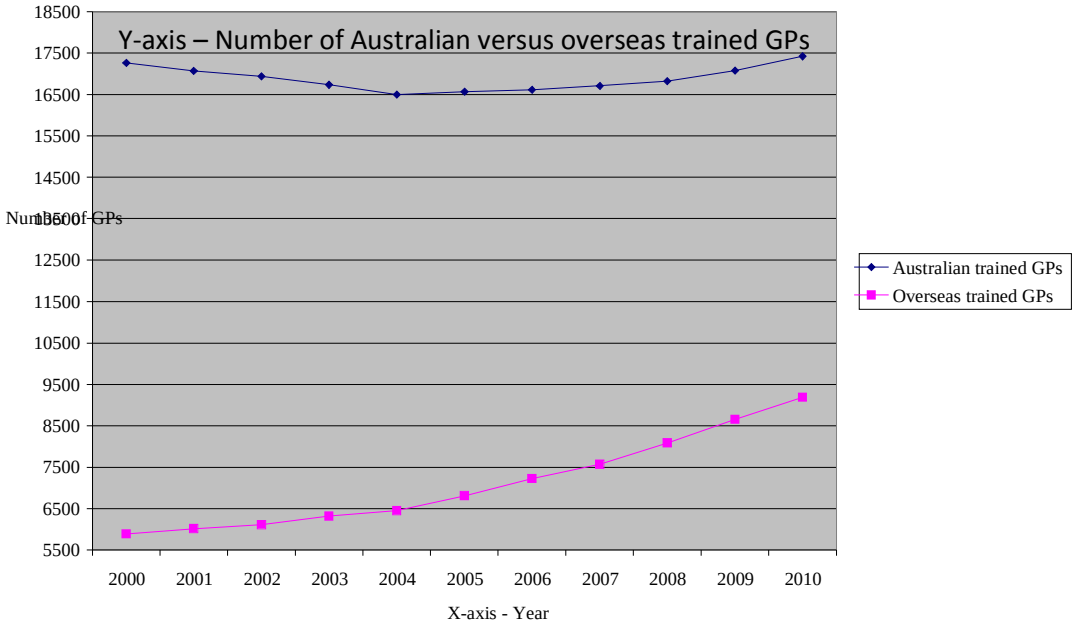

Figure 6. Number of Australian trained vs. overseas trained GPs (by year)

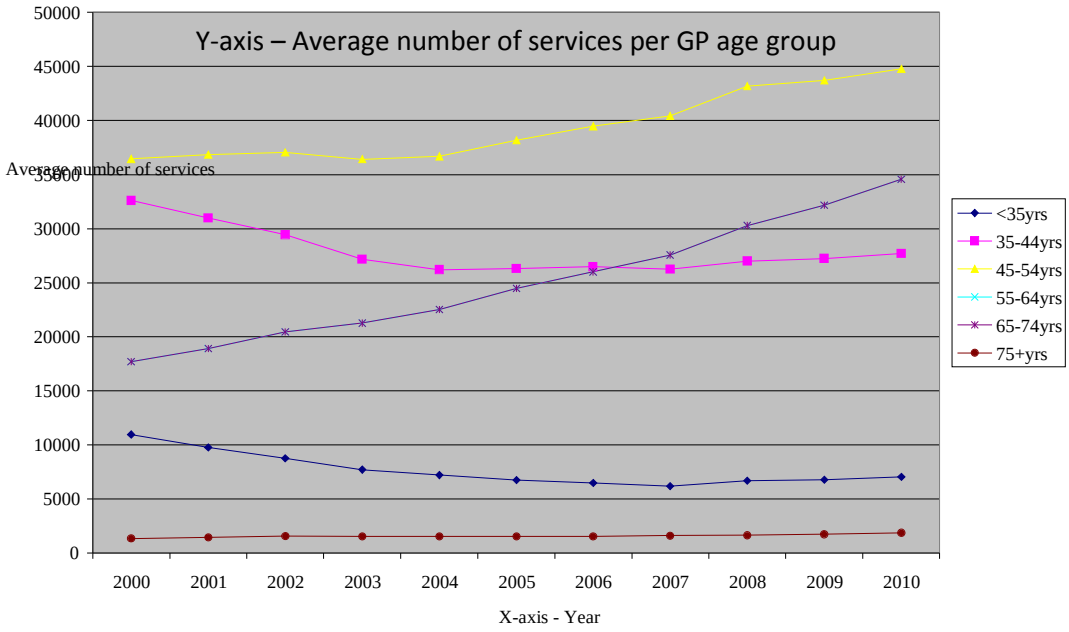

Figure 7. Average number of services rendered by GPs per age group (by year)

4. DISCUSSION

It seems fairly clear that the years 2008-2010 have marked some kind of a watershed relative to previous years with significant increases in the number of GPs, the number of female GPs, the number of GPs trained overseas, the number of GP registrars, the number of vocationally trained GPs, the number of 55-64 and 65-74 year old GPs, and the number of services performed by 45-54, 55-64 and 65-74 year old GPs. These changes are to be expected and favourable given the emphasis on workforce planning since the late 1990s (DoHA, 2005, 2008; AIHW, 2006; AMWAC, 2005; Brooks and Lapsley, 2005; Lewis, 2002).

Given the ageing of the Australian population an ongoing strategy to increase younger GPs needs to be given due consideration to ensure a sustainable workforce. Overall, the number of 35-44 year old GPs gradually decreased over the study period; except for a slight increase in 2008-2010, although this increase was much lower than in 2000. Likewise, the number of services rendered by this age group declined from 31% in 1999-2000 to 23% in the 2009-2010 periods. However, the greater proportion of women GPs will also put more pressure on the GP workforce, if this group of GPs continues to favour part time work (Charles and Valenti, 2004). The increase in the proportion of female GPs may be due to more females graduating from medical schools and entering into general practice training than males.

An interesting observation was made in the form of a decrease in the annual number of GPs <35 years of age, which was also inversely related to the population growth over the studied eleven years period. The GP Workforce Index ratio (GPWIR = No. of GPs<35yrs ÷ No. of GPs 35yrs to 64yrs of age) may be a useful national indicator for evaluating the proportion of GPs<35yrs of age as a proportion of annual GP workforce. Lower GPWIR may be associated with GP workforce shortage. However, this indicator may be limited by the fact that there was no prior existing index for evaluating the number of younger GPs<35 years as a proportion of the GP workforce. GPWIR was highest in 2000 at 0.223 and was lowest in 2007 at 0.118, only to increase slightly back to 0.128 in 2010. The increase in 2010 may be associated with an increase in the number of medical graduates from Australian Universities and also a modest increase in GP training positions. Lower GPWIR may be associated with GP workforce shortage.

The Department of Health and Ageing definition of GP workforce shortage as a GP to population ratio of 0.71:1000 may be useful in helping the Department of Immigration in determining regional and rural and remote migration for GPs entering Australia as this was only designed to show specific geographic location with workforce shortage, for example, regional, rural and remote areas. This ratio may therefore be useful in helping the Department of Immigration in determining regional and rural and remote migration for GPs entering Australia. The ratio also gives less information if applied nationally as city locations may have adequate or oversupply of GPs. However, this ratio may further help the Department of Immigration in increasing the migration quota for migrating GPs to match the number of other migrants' intake annually at the (DoHA) ratio of 0.71:1000 migrants in order to maintain the current levels of GPs in Australia. However, given the shortage of medical graduates in low-income countries the recruitment of such graduates is ethically challenging (Hagopian, 2007).

The number of overseas trained GPs in the workforce increased over the study period to offset for the overall decline in GP numbers. It was also an interesting finding that the overseas trained GPs provided more services than Australian graduates during the study

period, the reason for this was not explained by the available data. There is therefore a need to ensure that an appropriate number of training places are available for Australian medical graduates as this may enable a self- sufficient workforce supply for Australia and may reduce the reliance on overseas trained graduates (Carver, 2008).

More GPs were vocationally registered in 2010 than in 2000, a likely indication that more GPs are following both Royal Australian College of GP (RACGP) and Australian College of Rural and Remote Medicine (ACRRM) programs and attaining fellowships in 2010 than in 2000 and more junior doctors are being trained as registrars. This may be due to the fact that in order to obtain a provider number for independent practice, GPs trained in Australia after 1996 must obtain vocational registration (Medicare Australia, 2011). Therefore, the increase in vocational registration does not indicate any tendency to the adequacy of numbers of registrars or of training positions, especially if the population growth is considered. More training places may need to be created to match the current demand and steady population growth in Australia.

If we adjust for the number of full time equivalent (FTE) GPs in 2010; 16,482 out of 26,613 GPs (i.e. 62% FTE GPs), the ratio of GP/population is much greater with per one GP at FTE GP/population = 1: 1355, indicating there was an adequate number of GPs in Australia in 2010. Therefore, the definition of shortage of doctors in terms of the ratio of full-time equivalent (FTE) doctors to patients of less than 0.71:1,000 (DoHA, 2005) is mainly relevant to the needs of each individual town and locality, and not nationally. However, the national relevance lies in its confirmation of the need for GPs to redistribute nationally from regions of oversupply of GP in some cities according to the ratio into regional, rural and remote areas where shortages exist. Furthermore, Australia will benefit from the resettlement of migrant GPs into the areas of workforce shortages determined by this ratio rather than settling them in regions of adequate GP workforce.

The total number of services rendered by Australian GPs increased from 105,048,000 in year 2000 to 126,950,000 by 2010. This increase may be partly due to the increase in population, however, it is important to emphasise the fact that public consciousness and awareness about health issues, healthy living and the need to seek advice about preventable illnesses have increased over the eleven years period of this study. These issues therefore may further explain why GP services might have increased across the board.

The District of Workforce Shortage (DWS) and the Area of Needs (AON) program need to appeal to Australian trained doctors and not just overseas trained doctors on temporary moratorium for 3-10 years. The effects of the brain drain of GPs from developing countries, and from rural to urban areas need addressing via a redistribution of GPs to areas of shortage. Other helpful measures might include: the development of rural infrastructure to aid the allocation of doctors to rural areas, the recruitment of students from rural areas, rural hometown placement after graduation, acquisition of rural experience by using rural facilities for training, establishment of rural medical schools, and by encouraging graduates to remain in public sector practice by restricting access to private practice. Furthermore, new programs dedicated to Australian trained GPs need to emerge such as ‘a rural mentoring program’ and ‘adopt a rural town program’ that will enable Australian trained GPs to visit their adopted rural and remote towns to work periodically. Furthermore, medical trainees and the community would benefit from trainees spending time in rural communities under the mentorship of experienced GPs. In addition, increasing the number of places available under

the RACGP's postgraduate training program would help address the chronic shortage of GPs, particularly in rural areas.

5. CONCLUSION

A mismatch exists between the numbers of GPs in particular age groups and the Australian population that is becoming more significant as the Australian population grows. More specifically, there are increasingly few GPs<35 years old to replace older retiring GPs. Overseas trained doctors have increased significantly over the last eleven years by 56% and they are required to work under moratorium in rural and remote areas before they can obtain unrestricted access to Medicare or work in an urban location not designated as areas of workforce shortage. Such measures offer short-term solutions and do little to encourage these GPs to work in other areas of need such as aged care. The number of female GPs has increased by 34.8% but they mainly work part-time while the number of male GPs who mostly work full-time has barely increased (0.94%) over eleven years. The impact that an increase in the number of females GPs graduating from medical schools may have on the overall number of GP services available to the Australian population requires further studies, since it was noted in the literature that female GPs are more likely to work part-time than male GPs. Even if there was to be an increase in the number of medical students' training places to at least match the level of population growth in Australia, it remains unclear how that will increase the number of physicians going into general practice in comparison to those going into other specialist trainings. Therefore, further study is required into this.

The GP Workforce Index ratio (GPWIR = No. of GPs <35yrs ÷ No. of GPs 35yrs to 64yrs of age) may be a useful national indicator for evaluating the proportion of GPs <35yrs of age as a proportion of annual GP workforce. Lower GPWIR may be associated with GP workforce shortage. GPWIR has increased in the last 3 years of the study corresponding with an improvement in GP supply. On the other hand, the Department of Health and Ageing definition of GP workforce shortage as a GP to population ratio of 1:1408 or 0.71:1000 was not a useful national predictor of workforce shortage. It may however be in helping the Department of Immigration in determining regional and rural and remote migration for GPs entering Australia as this DoHA ratio was only designed to show specific geographic location with workforce shortage, for example, regional, rural and remote areas. There is therefore a need for an indicator like a GP Workforce Index ratio (GPWIR) that may help in predicting overall national GP workforce shortage. More research is required for special interest sectors, such as the aged care sector, regarding new predictors for GP workforce shortage in such sector since the DoHA ratio of 0.71:1000 or 1: 1,408 patients does not take into account the character, complexity and multidisciplinary requirements of older patients and is therefore not applicable to aged care sector. The Department of Health and Ageing may need to keep increasing the number of students entering medical schools, however, these numbers have been almost trebled over the last decade, and it is unclear how post university training places will be provided for the extra number of graduates which outstrips available post-graduate GP training positions.

Finally, Improvement in GP wages and working conditions and various public campaigns may help promote general practice among other medical specialties, however further studies into why medical graduates decide to become a GP are needed.

6. STUDY LIMITATIONS

Data for this study were obtained from trusted sources, i.e. Australian Department of Health and Ageing and Australian Bureau of Statistics. Future studies might consider interviews with GPs to identify factors involved in decisions about GP practice. The authors acknowledges that we have not reported any data on changes in the concentrations of medical specialists and how that might relate to the number of physicians going into general practice. Regional (urban/rural, state level) data was not presented due to limitations in the available data-set. There are limitations in the available data source for GPs; for example, no data was available regarding as no. of hours worked by GPs, or practicing location of GPs.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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