SSM-D-14-01247

Retaining rural doctors: doctors' preferences for rural medical workforce incentives

Jinhu Li[1], Anthony Scott[1], Matthew McGrail[2], John Humphreys[2], Julia Witt[3]

1. Melbourne Institute of Applied Economic and Social Research, The University of Melbourne

2. School of Rural Health, Monash University

3. Department of Economics, University of Manitoba

Corresponding author: Jinhu Li, Email: jinhu.li@unimelb.edu.au

Acknowledgements

This work, as part of the "Medicine in Australia: Balancing Employment and Life (MABEL)" longitudinal survey of doctors, was supported by a National Health and Medical Research Council Health Services Research Grant (454799) and the Australian Commonwealth Department of Health and Ageing. The findings and views in this paper are those of the authors alone. We thank the doctors who gave their valuable time to participate in MABEL, and the other members of the MABEL team for data cleaning and comments on drafts of this paper.

Retaining rural doctors: doctors' preferences for rural medical workforce incentives

Abstract

Many governments have implemented incentive programs to improve the retention of doctors in rural areas despite a lack of evidence of their effectiveness. This study examines rural general practitioners' (GPs') preferences for different types of retention incentive policies using a discrete choice experiment (DCE). In 2009, the DCE was administered to a group of 1,720 rural GPs as part of the "Medicine in Australia: Balancing Employment and Life (MABEL)" study. We estimate both a mixed logit model and a generalized multinomial logit model to account for different types of unobserved differences in GPs' preferences. Our results indicate that increased level of locum relief incentive, retention payments and rural skills loading leads to an increase in the probability of attracting GPs to stay in rural practice. The locum relief incentive is ranked as the most effective, followed by the retention payments and rural skills loading payments. These findings are important in helping to tailor retention policies to those that are most effective.

Key words: Australia, discrete choice experiment, incentives, physicians, rural, retention

Introduction

In many developed countries, there is a long-standing shortage of doctors in rural areas. Due to the difficulties associated with attracting and retaining doctors to areas of workforce shortage, governments have implemented several incentive schemes designed to encourage doctors to move to, and stay in, rural areas. Australia is no exception to implementing such incentive programs (Mason, 2013), yet there continue to be shortages of general practitioners (GPs) in rural areas and a lack of high quality evidence that evaluates the effectiveness of such schemes (Barnighausen & Bloom, 2009; Buykx et al., 2010; Grobler et al., 2009; Humphreys et al., 2001).

One key issue is that the average length of stay for doctors practising in rural areas is significantly less than in metropolitan areas. Studies have shown that doctors who move to rural areas are likely to leave rural areas after the first two years (D. J. Russell et al., 2013a; D J Russell et al., 2013b). The specific reasons causing doctors to leave rural areas remain unclear. While some research has highlighted the factors associated with length of stay in rural practice, such as on-call arrangements, professional support and variety of rural practice, (Humphreys et al., 2001; Humphreys et al., 2002), there is a lack of empirical evidence about whether existing retention policies have effectively increased the length of stay of doctors in rural areas, and more importantly which types of incentives are most effective in bringing about improved medical workforce retention in rural areas. This lack of evidence is partly due to the fact that little data exist on doctors' revealed preferences towards different types of incentives. Given this data limitation, we adopt a stated preference approach and employ a discrete choice experiment (DCE) in an attempt to address these issues.

In 2009, we conducted a DCE on rural GPs who participated in the "Medicine in Australia: Balancing Employment and Life (MABEL)" study. At that time rural GPs in Australia were

eligible for some assistance from different programs designed to improve rural recruitment and retention. In 1992-93, the General Practice Rural Incentives Program (GPRIP) was established to help address the mal-distribution of GPs in rural areas, and subsequently included a separate Rural Retention Program (RRP) for GPs in rural and remote areas from 1999 (L. Russell, 2013). In addition, the Practice Incentives Program (PIP) introduced in 1999 includes a component of rural loadings added to total PIP payments payable to the GP practice based on the geographical size of the region and the remoteness of the practice. By the time of our study in 2009, both the GPRIP and RRP remained, though the eligibility criteria and payments formula for GPRIP and RRP were changed in 2009-10. Notably, new funding for rural locum relief also began in 2009. Despite these policies existing in the preceding 17 years, difficulty continues in retaining GPs in rural areas. Hence it is important to examine how retention incentive policies can improve the length of stay of doctors practising in rural Australia.

This study aimed to examine rural GPs' preferences for different types of retention incentives using a DCE. Specifically, we considered which key incentives are likely to be most effective in improving the retention of GPs in rural areas. The main purpose of this DCE is to determine whether a new or modified set of incentives is likely to influence retention. Our focus therefore was solely on workplace attributes that governments could modify using specific rural workforce policies. Hence, we limited possible retention incentive packages to a mix of a locum relief guarantee, GP retention payments, a rural skills loading, and family isolation payments to assist with school fees.

This study provides the first comprehensive empirical evidence to inform workforce retention policies on the effectiveness of possible interventions that governments could use to improve the length of stay of GPs in rural areas. Currently, there is little empirical evidence on doctors'

preferences towards different job attributes due to the paucity of data on revealed preferences. As a result, DCEs have been increasingly used to address these issues on the job preferences of doctors (Lagarde & Blaauw, 2009). Furthermore, this study acknowledges the distinction between retention incentives and recruitment incentives. While there is undoubtedly some overlap between the factors associated with recruitment and retention, this distinction is particularly important because recruitment and retention may nonetheless require different types of incentive schemes.

Data

The DCE was conducted as part of Wave 2 of the "Medicine in Australia: Balancing Employment and Life (MABEL)" longitudinal survey of doctors in 2009. The MABEL study was approved by the University Of Melbourne Faculty Of Business and Economics Human Ethics Advisory Group (Ref. 0709559) and the Monash University Standing Committee on Ethics in Research Involving Humans (Ref. CF07/1102 - 2007000291). In Wave 1, the survey was sent to the population of 54,750 doctors in Australia and the overall initial response rate was 19.3% (10,498/54,750). In Wave 2, the MABEL survey was sent to a sample of 15,871 doctors including 5,074 GPs. These GPs included those who completed the Wave 1 survey in 2008 (n=3,825) as well as those GPs who were new in the workforce in 2009 ((n=1,249) part of the Wave 2 cohort of new doctors) (Yan et al., 2012).

As part of the Wave 2 mail-out, GP surveys that included the DCE were sent to GPs practising in rural areas. The group of rural GPs was defined using the Rural, Remote and Metropolitan Area classification (RRMA), and included GPs in RRMA's rural categories 3-7 (Department of Primary Industries and Energy and Department of Human Services and Health, 1994). Based on this definition, 1,720 GPs included in our sampling frame were

practising in rural areas at the time and therefore were invited to participate in the DCE (116 in the pilot and 1,604 in the main wave).

Development of Questionnaire

All attributes were selected on the basis of existing literature, expert advice from relevant professional organisations on key factors influencing GP retention in nonmetropolitan areas, and the fact that governments could feasibly implement them to improve rural workforce retention (Buykx et al., 2010; Hays et al., 1997; Humphreys et al., 2001; Viscomi et al., 2013; World Health Organization, 2010). All attributes were designed with a baseline level equivalent to 'no change' and two alternative levels of increasing pecuniary or non-pecuniary value.

The first stage of piloting examined content and face validity. This involved face-to-face and telephone interviews with a convenience sample of 10 rural and remote doctors from Victoria, NSW, Queensland and WA. This group covered RRMAs 3-7; males and females; an overseas trained doctor and a GP registrar. Some of the doctors had participated in MABEL Wave 1. The wording of some attributes and the values of some levels were refined during the pilot interviews. Once the desired attributes and levels for the rural GP DCE were chosen, a DCE was included in the Wave 2 pilot to collect data for the prior values of the parameters in our final DCE. The pilot design included an additional attribute (availability of continuing medical education) but this was dropped from the main survey as it is compulsory, and so does not differentiate significantly between doctors based on their location. The final set of attributes and levels used in the DCE are shown in Table 1.

Difficulty getting time off is often a deterrent to taking up practice, and a key trigger to leaving rural practice (Joyce et al., 2003). Many doctors working and living in small and isolated rural areas feel trapped or unable to get relief (Hays et al., 2003; Rourke et al., 2003). We tested two levels of paid locum relief for either four or six weeks per year, based on 'reasonable' levels of paid leave for GPs working in rural communities.

Retention grants for rural GPs have been available for more than ten years (L. Russell, 2013). A recent evaluation of Australian Government support programs of the health workforce recommended the continuation of retention grants (Mason, 2013), although research suggests that the distribution of funds should better match the context of what work rural doctors do and where they do it (Humphreys et al., 2012). Despite little evidence of their effectiveness, retention grants are simple-to-apply incentives aimed at compensating rural doctors for both their geographic isolation and more complex work practices (Humphreys et al., 2003; Viscomi et al., 2013). With rural doctors already receiving varying retention grant amounts, we tested two levels presented as 25% and 50% increases to their current support.

Rural GPs enjoy the variety and challenge of rural practice, including the opportunity to undertake more complex roles (Humphreys et al., 2003; Pathman et al., 1996; Rourke et al., 2003); however, the number of rural proceduralists are declining (Robinson et al., 2010). Rural doctors have been advocating a rural skills loading, based on the complexity of services they provide (usually procedural) and adjusted for location so the most remote doctors who are furthest away from specialist support get a larger loading (Rural Doctors Association of Australia, 2012). We included three levels of skills loading levels, none, 10% and 20% loading, to reflect the more complex skills being used and increased difficulty of rural doctors to maintain their skills.

Rural isolation often affects GPs' spouses and children, who also live in communities where the range of services and facilities characterising metropolitan cities is absent (Feeley, 2003; Hays et al., 2003; Humphreys et al., 2001; Veitch & Crossland, 2005). Notably, adequacy of schools is a frequent issue identified by doctors, although boarding schools can provide an alternative schooling option. Hence overcoming the costs of distance from services which meet their needs such as boarding schools represent a significant expense for some rural doctor's families. We included three levels for this attribute, no secondary school costs paid, 50% of costs paid, and 100% of boarding costs paid.

Choice Experiment Design

The above attributes and levels were combined into different incentive packages using an efficient experimental design. The efficient choice design uses anticipated (or prior) values of the coefficient of each attribute from the pilot survey (Carlsson & Martinsson, 2003). The model is a main effect only design, as *a priori* there was no reason to believe that the level of any specific attribute would affect the preferences for another attribute.

SAS® 9.1 software was used to generate an efficient design minimizing the D-error (Kuhfeld, 2005). Since the final design had only four attributes, it was possible to generate a 100% efficient orthogonal candidate set with only 9 sets. This candidate set was used to generate an efficient design with 9 choice pairs blocked into two sets, one with 4 questions, the other with 5 questions. Respondents were randomly assigned one block of choice pairs in their questionnaire.

The DCE presents respondents with a series of hypothetical choice questions. In each choice occasion, a respondent is asked to choose among a pair of unlabelled incentive packages i.e.

"Option A" and "Option B", and an opt-out alternative (see Figure 1). The opt-out alternative is expressed as "Neither option would influence my decision to stay" (referred to as "Neither" hereafter).

It has been increasingly recognized in the DCE literature that unforced choice experiments should be used instead of forced choice because it resembles more closely the reality the respondents face when they have the opportunity to choose non-participation, or to choose their status quo situation. Some argue that the interpretation of the estimated preference from a forced choice experiment is problematic because the estimates are conditional on the assumption of certain participation in service or certain consumption of good (Lancsar & Louviere, 2008). Further, it has been shown that the omission of a status quo alternative can bias welfare measures (Boxall et al., 2009). Recent literature on DCEs suggests that if the respondents choose the status quo option, then this option can be coded as an alternative with the specific individual levels of the attributes that represent their current situation (Hess et al., 2008; Scott et al., 2013).

In our context, it is important to include an opt-out alternative for several reasons. First, a rural GP might not be influenced by any of the proposed new incentives. For example, the doctor may be under restrictions relating to their practice location, and therefore any type of incentive is irrelevant for their location choices as they are mandated to stay there anyway. Second, GPs who chose "Neither" may prefer their current arrangements of rural incentives and so prefer the status quo. Third, some GPs might be determined to leave rural practice no matter what the incentive levels are. Finally, there is also the possibility that GPs were not actively engaging with the DCE and so were choosing 'neither' as a random response. In the analysis we examine the characteristics of GPs who choose the neither option.

There are two ways to code the attribute levels for a general opt-out or a neither option. One is to code it as an alternative with zero attribute levels, the other is to code the attributes as missing values (Hensher et al., 2005; Ryan & Skatun, 2004). We coded the attributes as zeros to avoid loss of data and power. In addition, the incentive packages we presented did not exist at the time of the survey and so coding the neither option as zero reflects the current status quo of the rural GPs. Specifically, we coded the "Neither" option as zero incentives for the three attributes of locum relief guarantee, rural skills loading and family isolation. For the attribute of GP retention payment which did already exist at the time of survey, we coded the "Neither" option as the lowest level which is 'no change' in retention payments.

Analysis

Individuals are assumed to make choices that maximize their utility, given by:

$$U_{nij} = \beta x_{nij} + \varepsilon_{nij} \qquad (1)$$

$$n= 1, \ldots, N;\ i = 1, \ldots, I;\ j = 1,\ldots,J.$$

where U_{nij} is the utility of physician n from choosing alternative i on choice occasion j, x_{nij} is a vector of observed attributes of alternative i, β is a vector of marginal utilities of these attributes, and ε_{nij} is an error term that is independently and identically Gumbel distributed. The probability of choosing alternative i is:

$$P\left([i|X]_{nj}\right) = \frac{e^{(\beta x_{nij})}}{\sum_{k=1}^{I} e^{(\beta x_{nij})}} \qquad (2)$$

Multinomial logit models were estimated to model GPs' preferences towards different incentive packages. Recent literature has suggested that a mixed logit model can be used to

allow for unobserved heterogeneity in the coefficients of the model (Hall et al., 2006; Hole, 2008). Specifically, the choice probability given by equation (2) is extended by integrating the choice probability over the density of β as:

$$P\left([i|X]_{nj}\right) = \int \frac{e^{(\beta x_{nij})}}{\sum_{k=1}^{I} e^{(\beta x_{nij})}} f(\beta|\Theta) d\beta \qquad , \qquad (3)$$

where *f(β)* is the assumed distribution of the coefficient vector *β*. The mixed logit model can extend to the generalised multinomial logit (GMNL) model to allow for scale heterogeneity, which means that the variance of the error term varies across respondents but is the same among choices for the same respondents (Fiebig et al., 2010). The literature suggests that scale heterogeneity is particularly important for the empirical estimation using DCEs, because in this setting respondents may vary in how 'certain' they are in their responses, or some respondents answer the DCE more 'seriously' than others (Flynn et al., 2010). In a GMNL model, the individual specific coefficient vector β_n can be presented as:

$$\beta_n = \sigma_n\left(\bar{\beta} + \widetilde{\beta_n}\right) \qquad (4)$$

where the scalar $\sigma_n = \exp(\bar{\sigma} + \tau\upsilon_n)$ is the scaling factor, $\upsilon_n \sim N(0,1)$ and $\widetilde{\beta_n} \sim N(0, \Sigma)$. The parameter $\bar{\beta}$ is a vector of means of the coefficients, Σ is the associated covariance matrix of the coefficients and τ is a scalar measuring scale heterogeneity.

We first estimate a mixed logit model to account for potential inherent taste heterogeneity in GPs' preferences. We then estimate a GMNL model to take into account potential scale heterogeneity in GPs' preferences. Both models are estimated with 500 Halton draws. We choose the model that best fits our data based on several model selection criteria. Specifically, we rely on BIC instead of AIC to choose between mixed logit and GMNL model, because the literature has suggested that BIC is the most reliable criterion for choosing the correct model

when modelling heterogeneity in this type of choice behaviours (Fiebig et al., 2010; Keane & Wasi, 2013). We estimate both uncorrelated and correlated parameter specifications of the mixed logit and GMNL models and use AIC to assess whether error correlations are important.

We use these models to examine a number of issues. First, we examine which type of incentive policy is likely to be most effective in improving medical workforce retention in rural areas. Second, we simulate the effects of different rural retention incentive packages on the probabilities of attracting GPs to stay in rural practice. Third, we examine the characteristics of GPs who choose the 'neither' option. This will inform us of the types of GPs for which these incentive packages have no influence on their decision to stay. Finally, we examine how the relative importance of different types of incentive varies across different types of GP.

The first specification (Model 1) we estimate includes attributes and an alternative-specific constant (ASC) indicating whether the respondent chose "Neither", "Option A" or "Option B". We use effects coding for the attributes in all specifications. Since this is an unlabelled choice design, there is no reason to believe the respondents treat Option A and Option B differently. Accordingly, we do not use separate ASCs for Option A and Option B, i.e. the ASC equals to 1 if "Neither" was chosen and 0 if Option A or B was chosen.

To better understand GPs who are not influenced by incentives thus choose "Neither", we add to the specification of Model 1 a set of interaction terms between GP characteristics and the ASC (Model 2). We will focus on the coefficients of these interaction terms and the signs of these coefficients will inform us which GP characteristics are associated with higher/lower utility for Option A or B relative to "Neither".

Rural GPs might be more or less attracted to rural incentives due to different reasons.

i) Some rural GPs, mainly international medical graduates (IMGs), are subject to restrictions on their practice location for a certain period of time, so any rural incentives are less relevant for them.

ii) Because IMGs may have specific cultural needs and views, IMGs might respond differently to incentives from domestic GPs.

iii) Recent Australian-trained GPs (particularly in the last 10-15 years) have had significant rural content within their training, which may influence their response to incentives.

iv) GPs who grew up in rural areas may have a stronger preference to remain in rural areas, and so may be less responsive to incentives.

v) GPs with fewer children will be less likely to seek extra financial and non-pecuniary support, and so will be less responsive to certain incentives.

vi) GPs with high (excessive) on-call load may want to either be 'rewarded' by incentives or looking for a break that is covered by locum relief guarantee.

vii) GPs in more demanding small rural or remote locations may place a higher importance on incentives.

In order to examine the diversity of GPs' preferences towards specific types of incentive, we estimate an additional specification in which certain GP characteristics are interacted with some of the incentive attributes (Model 3). Specifically we test the following four hypotheses:

i) GPs with dependent children are more likely to respond to school cost payment incentive;

ii) Doctors who work in a hospital setting are more likely to respond to skills loading incentives than those who work in a non-hospital setting (hospital setting is a proxy for procedural work);

iii) GPs with more frequent on-call are more likely to respond to locum relief incentives;

iv) Doctors in small rural areas are more responsive to locum relief incentives.

Results

Descriptive statistics results

Of the 1,604 rural GPs who were sent the main DCE survey, 1,165 responses were received, yielding a response rate of 72.6%. The average age of respondents was 48 years old, and 40% of them were female doctors. While 40% of responding rural GPs were foreign trained, 72% of the respondents were not subject to any restriction on their practice location. Almost half (47%) of these GPs lived in rural areas for many years until leaving secondary school; among all respondents the average number of years living in rural areas is 5 years. More than half of GPs were working in a salaried position. These rural GPs have a relatively high workload: total weekly working hours are 43 hours on average; 19% of the GPs have a very high on-call ratio which is 1 in 2 weekend/weeknight or even more, while 31% have modest on-call ratio which is between 1 in 2 weekend/weeknight and 1 in 5 weekend/weeknight.

Of the 1,165 respondents, 48 GPs (4.1%) did not answer any of the DCE questions. The analysis was therefore conducted on 1,117 GPs who provided responses to at least one of the DCE questions. Among these 1,117 GPs, 25.6% of them chose “Neither” for all DCE questions, 46.1% of them never chose “Neither” for any of the DCE questions while 24.2% of them chose “Neither” in at least one but not for all questions. In all the observed choice occasions, the “Neither” option was chosen 36% of the time.

Estimation and simulation results

According to the BIC values, a mixed logit model is preferred to a GMNL model. While the AIC values indicate that using a correlated parameter mixed logit model might improve the model fit, we use the uncorrelated parameter mixed logit model as our main model and estimate a correlated specification as sensitivity analyses. The sensitivity analyses show a correlated specification provides very similar estimates and virtually makes no difference to the main conclusion. Due to limited space we only present our main model here but other results are available upon request.

Table 2 presents the regression results of Model 1 using a mixed logit model. The first column lists the mean coefficients and the second column lists the standard deviation coefficients. The positive and statistically significant estimates of the mean coefficient of the attributes of locum relief guarantee, GP retention payments, and rural skills loading indicate that increasing the level of these attributes from zero to the middle and high levels will increase the probability of attracting GPs to stay in the rural practice. However, for family isolation payment the mean coefficient of the middle level of this attribute is statistically insignificant and the coefficient of the high level is only statistically significant at 10% level, suggesting that providing this incentive will not increase the probability substantially.

The magnitude of the estimated standard deviations of each coefficient is indicative of the amount of preference heterogeneity for each specific attribute across GPs. All but two of the coefficient distributions have large and statistically significant standard deviations, suggesting the existence of heterogeneity in GPs' preferences over all four attributes.

As a robustness check, we re-estimated Model 1 only on those DCE respondents who remained in rural practice one year or two years later, because these doctors represent a much cleaner sub-sample which excludes the GPs who chose "Neither" as they were determined to leave. The results are qualitatively very similar to our main results.

In order to compare the effectiveness of different retention policies, we calculate the predicted probability of GPs choosing an incentive package over the "Neither" option under a baseline scenario, and compared the changes in the probability of moving from the baseline to each of the hypothetical scenarios representing different retention policies. The predictions were implemented by using maximum simulated likelihood methods and the simulation is based on Halton sequences for integration. We used 500 Halton draws for these predictions.

It is worth noting that we are not claiming a GP who chose "Neither" necessarily preferred to stay or to leave—it could be either case out of various reasons. Instead, we interpret choosing "Neither" as that the proposed incentives wouldn't matter in terms of attracting doctors to stay in rural practice. Comparing the changes in this probability would tell us how the variation in the incentive attributes and levels would affect doctors' preferences on the margin. Table 3 shows the predicted probabilities of several hypothetical scenarios. Each column shows the predicted probabilities of choosing "Option A" over "Neither" under a specific scenario described by different levels of the attributes. Scenario A shows the predicted probability when all the attributes are set at the zero level (status quo or their current situation). The predicted probability of choosing "Option A" under this scenarios is 0.266, a number representing the take-up rate of any new incentive package regardless of its attributes. Scenario J in the last column shows that even when all the attributes are set at the highest levels, only 67% of the rural GPs are influenced by incentives to stay in a rural area. In between the first and the last column, Table 3 lists the predicted probabilities when we set one of the four attributes first at the middle and then at the high level, keeping the other three attributes at zero level. For instance, Scenario B shows the predicted probability of choosing "Option A" when the GPs are provided 4 weeks in 12 months of locum relief guarantee and no other incentives is 0.414, representing an increase of 55.6% (or 14.4 percentage points) comparing to the baseline scenario (Scenario A). Scenario C shows that

the predicted probability when GPs are provided 6 weeks in 12 months of locum relief guarantee and no other incentives is 0.447, indicating an increase of 68%. Comparing across the probabilities under these scenarios, we can see that on average the locum relief incentive is ranked as the most effective among the four, followed by the retention payments, rural skills loading and family isolation payments.

Table 4 presents the regression results of Model 2 using a mixed logit model. Our focus in this model is on the interaction terms between GP characteristics and the ASC. It is worth noting that the standard deviation of the ASC is statistically significant and large relative to the mean estimate. This is not surprising because GPs might choose "Neither" for different reasons: some of these reasons are not captured by the included interactions thus the heterogeneity in preferences still remains. We interpret the mean coefficient of the interaction terms as the incremental effect of marginally changing this GP characteristic on changing the indirect utility of the alternative. For example, the coefficient on interacted ASC and GP age indicates that, holding other things equal, increasing GP age by one year decreases the utility of choosing A/B relative to choosing "Neither". The sign of the mean coefficient estimate of the interaction terms indicates that older GPs, GPs without dependent children, GPs working in non-hospital settings, GPs with low on-call, and GPs working in larger rural areas tend to choose "Neither". Our hypotheses that GPs who are subject to practice location restrictions, GPs with a rural background, fewer hours worked, and being salaried, would be less responsive to incentives are also not supported.

The estimation results from Model 3 are listed in Table 5. The sign of the mean coefficient estimates of the interaction terms indicate whether certain subgroups of GPs have heterogeneous preferences toward specific incentive policies. We also present the Chi Square test statistics and p-values of the joint test for interaction terms representing each of the four

hypotheses. As expected, GPs with dependent children are more responsive to family isolation payments and GPs working in a hospital setting are more responsive to rural skills loading incentives. However, there was no evidence for differences in preferences towards locum relief incentives across GPs with different on-call ratios, or any evidence for difference in preference towards locum relief incentives across different rural area sizes. Locum relief incentives seem to be important for all rural GPs regardless of location or on-call load.

Table 6 shows how the predicted probabilities vary across subgroups that differ by dependent children status and whether working in a hospital setting. Each column presents the predicted probabilities of choosing an incentive package over the "Neither option" under one of the four scenarios, namely no new incentives (the baseline), highest level at all four attributes, setting the attribute in question to middle level while keeping all other attributes at zero, and setting the attribute in question to highest level while keeping all other attributes at zero. The calculation is the same with the previous one used in Table 3. But in Table 6 we only list the predicted probability of choosing "Option A", not the predicted probability of choosing "Neither".

The first block of Table 6 lists the predicated probabilities across subgroups that differ by dependent children status. For example, the third column indicates that under the scenario of middle level family isolation compensation (zero level of other attributes) the probability of choosing an incentive package is 0.299 for doctors with dependent children, and is 0.241 for doctors without dependent children. This represents a difference of 5.8 percentage points between these two subgroups. The second block contrasts the predicated probabilities for those who work in hospital setting and those who don't. The third column shows that under the scenario of middle level rural skills loading the probability of attracting GPs to stay in rural practice is 5.9 percentage points higher for GPs working in a hospital setting than those

not, while the difference in probability is 10.0 percentage points between these two groups under the scenario of highest level rural skills loading.

Discussion

Given the persistent difficulties associated with recruiting and retaining doctors in rural areas, it is vitally important to ensure that workforce incentive policies are formulated and evaluated on the basis of comprehensive empirical evidence. To date, there has been inadequate evaluation of the impact of current incentive schemes in Australia, and almost no high quality evaluations from other countries. In the absence of rigorous evaluations using revealed preference data on retention patterns, DCEs provide an alternative method for examining the likely effects of retention incentives. In particular, DCEs are useful in that they can examine the likely effects of policies that do not yet exist, thereby providing important information to guide the design of such incentives.

This study has examined the likely effect of new incentive packages on the probability of attracting GPs to stay for those already practising in rural areas. The types of incentives to retain doctors in rural areas might be different to those aiming to recruit them, a finding consistent with previous research highlighting the need to 'package' incentives according to circumstances or context (Buykx et al., 2010). Though previous studies have focused on recruitment incentives (Chomitz et al., 1998; Hanson & Jack, 2010; Hole & Kolstad, 2012; Kolstad, 2011; Scott et al., 2013), this study is the first to focus on retention incentives. Of rural GPs who responded, one-quarter (i.e. 25.6%) were not influenced by the rural incentive packages in all choices presented to them. These GPs were more likely to be older, have no dependent children, were not currently working in a hospital setting, have infrequent on-call, and are practising in a larger rural area. The results suggest that a 'one-size-fits-all' policy for

rural incentives may not be optimal, because such incentives are likely being paid to some GPs whose preference is unaffected by such incentives.

The results also showed that 27% of rural GPs would be more likely to stay with the new incentives, regardless of their attribute levels. This suggests a latent demand for new incentive schemes to encourage retention. However, even with the strongest incentive package only 67% would choose to stay with the new incentives compared to their current status quo.

In terms of the types of incentive package that would have most impact, a locum relief scheme would have the largest impact on improving the retention of rural doctors. While some support is now available in Australia through the Rural Locum Relief Program, this scheme is heavily oversubscribed (National Rural Health Alliance, 2012). Our study confirms the importance of expanding this scheme in future retention policies. Although our results indicate that such incentive scheme can be the most effective among all four alternatives, our research did not consider the costs of each type of incentives, which is also an important aspect of any incentive policy. In the end, decisions about which mix of incentives to adopt should be based on their expected cost-effectiveness, not only effectiveness itself (Lagarde et al., 2012). A key issue with locum schemes is that the success of such schemes depends on the availability of locums and, as current evidence shows, the costs of employing locums at usually high rates of pay could be prohibitive (National Rural Health Alliance, 2012). The importance of the locum relief scheme varied across GPs but this variation could not be explained by GP characteristics such as their current amount of on-call or type of rural area.

An increase in retention payments has the next largest effect on the probability of attracting GPs to stay in rural practice. A 10% or 20% rural skills loading was also an important factor influencing retention, especially for GPs who work in hospitals in rural areas. Finally,

although the subsidy of school fees was not significant overall, it was important for those GPs with dependent children.

Our study was not designed to examine the size of incentives required for retention. Our retention DCE also did not examine the effects of incentives on actual length of stay in terms of the number of years or months, but on the probability of attracting them to stay. Examining actual retention time would be difficult to implement in the context of a DCE, but is worth pursuing through further research.

To what extent incentive schemes impact upon recruitment and retention remains an unresolved issue. This research has shown that for some GPs, such schemes are unlikely to influence their decision to remain in a rural area, whilst for other GPs, locum relief schemes seem to be the most important policy initiative likely to improve rural medical workforce retention. Unfortunately, policies and incentives which propose to increase the retention of rural GPs continue to be introduced or modified without adequate empirical evaluation. Our study provides the first comprehensive empirical evidence that informs the effectiveness of such policies. This study has shown that the majority of GPs in rural areas might stay there longer as a result of incentive schemes. However, further research is required that evaluates the introduction or modification of such schemes to test their actual impact.

References

Barnighausen, T., & Bloom, D. (2009). Financial incentives for return of service in underserved areas: a systematic review. *BMC Health Services Research,* 9, 86.

Boxall, P., Adamowicz, W.L., & Moon, A. (2009). Complexity in choice experiments: choice of the status quo alternative and implications for welfare measurement*. *Australian Journal of Agricultural and Resource Economics,* 53, 503-519.

Buykx, P., Humphreys, J.S., Wakerman, J., & Pashen, D. (2010). Systematic review of effective retention incentives for health workers in rural and remote areas: Towards evidence-based policy. *Australian Journal of Rural Health,* 18, 102-109.

Carlsson, F., & Martinsson, P. (2003). Design techniques for stated preference methods in health economics. *Health Economics,* 12, 281-294.

Chomitz, K.M., Setiadi, G., Azwar, A., & Ismail, N. (1998). What do doctors want? Developing incentives for doctors to serve in Indonesia's rural and remote areas. In W.B.P.R.W. Paper (Ed.), #1888. Washington DC: The World Bank.

Department of Primary Industries and Energy and Department of Human Services and Health. (1994). Rural, remote and metropolitan areas classification 1991 census edition. Canberra: Australian Government Publishing Service.

Feeley, T.H. (2003). Using the theory of reasoned action to model retention in rural primary care physicians. *Journal of Rural Health,* 19, 245-251.

Fiebig, D.G., Keane, M.P., Louviere, J., & Wasi, N. (2010). The Generalized Multinomial Logit Model: Accounting for Scale and Coefficient Heterogeneity. *Marketing Science,* 29, 393-421.

Flynn, T.N., Louviere, J.J., Peters, T.J., & Coast, J. (2010). Using discrete choice experiments to understand preferences for quality of life. Variance-scale heterogeneity matters. *Soc Sci Med,* 70, 1957-1965.

Grobler, L., Marais, B., Mabunda, S., Marindi, P., Reuter, H., & Volmink, J. (2009). Interventions for increasing the proportion of health professionals practising in rural and other underserved areas. *Cochrane Database of Systematic Reviews*, CD005314.

Hall, J., Fiebig, D.G., King, M.T., Hossain, I., & Louviere, J.J. (2006). What influences participation in genetic carrier testing? Results from a discrete choice experiment. *J Health Econ,* 25, 520-537.

Hanson, K., & Jack, W. (2010). Incentives could induce Ethiopian doctors and nurses to work in rural settings. *Health affairs,* 29, 1452-1460.

Hays, R.B., Veitch, P.C., Cheers, B., & Crossland, L. (1997). Why doctors leave rural practice. *Australian Journal of Rural Health,* 5, 198-203.

Hays, R.B., Wynd, S., Veitch, C., & Crossland, L. (2003). Getting the balance right? GPs who chose to stay in rural practice. *Australian Journal of Rural Health,* 11, 193-198.

Hensher, D.A., Rose, J.M., & Greene, W.H. (2005). *Applied choice analysis : a primer*. Cambridge ; New York: Cambridge University Press.

Hess, S., Rose, J.M., & Hensher, D.A. (2008). Asymmetric preference formation in willingness to pay estimates in discrete choice models. *Transportation Research Part E: Logistics and Transportation Review,* 44, 847-863.

Hole, A.R. (2008). Modelling heterogeneity in patients' preferences for the attributes of a general practitioner appointment. *J Health Econ,* 27, 1078-1094.

Hole, A.R., & Kolstad, J.R. (2012). Mixed logit estimation of willingness to pay distributions: a comparison of models in preference and WTP space using data from a health-related choice experiment. *Empirical Economics,* 42, 445-469.

Humphreys, J.S., Jones, J., Jones, M., Mildenhall, D., Mara, P., Chater, B., et al. (2003). The influence of geographical location on the complexity of rural general practice activities. *Medical Journal of Australia,* 179, 416-420.

Humphreys, J.S., Jones, J.A., Jones, M.P., Hugo, G., Bamford, E., & Taylor, D. (2001). A critical review of rural medical workforce retention in Australia. *Australian Health Review,* 24, 91-102.

Humphreys, J.S., Jones, M.P., Jones, J.A., & Mara, P.R. (2002). Workforce retention in rural and remote Australia: determining the factors that influence length of practice. *Medical Journal of Australia,* 176, 472-476.

Humphreys, J.S., McGrail, M.R., Joyce, C.M., Scott, A., & Kalb, G. (2012). Who should receive recruitment and retention incentives? Improved targeting of rural doctors using medical workforce data. *Australian Journal of Rural Health,* 20, 3-10.

Joyce, C., Veitch, C., & Crossland, L. (2003). Professional and social support networks of rural general practitioners. *Australian Journal of Rural Health,* 11, 7-14.

Keane, M., & Wasi, N. (2013). Comparing Alternative Models of Heterogeneity in Consumer Choice Behavior. *Journal of Applied Econometrics,* 28, 1018-1045.

Kolstad, J.R. (2011). How to make rural jobs more attractive to health workers. Findings from a discrete choice experiment in Tanzania. *Health economics,* 20, 196-211.

Kuhfeld, W.F. (2005). Marketing Research Methods in SAS. Experimental Design, Choice, Conjoint, and Graphical Techniques. SAS 9.1 Edition; TS-722; Copyright 2005 by SAS Institute Inc., Cary.

Lagarde, M., & Blaauw, D. (2009). A review of the application and contribution of discrete choice experiments to inform human resources policy interventions. *Human Resources for Health,* 7.

Lancsar, E., & Louviere, J. (2008). Conducting discrete choice experiments to inform healthcare decision making: a user's guide. *Pharmacoeconomics,* 26, 661-677.

Mason, J. (2013). Review of Australian Government Health Workforce Programs. Canberra: Australian Government Department of Health.

National Rural Health Alliance. (2012). Locums and short-term contractors in the health workforce: Position paper. http://ruralhealth.org.au/document/locums-and-short-term-contractors-health-workforce. Canberra: NRHA.

Pathman, D.E., Williams, E.S., & Konrad, T.R. (1996). Rural physician satisfaction: its sources and relationship to retention. *Journal of Rural Health*, 12, 366-377.

Robinson, M., Slaney, G., Jones, G., & Robinson, J. (2010). GP Proceduralists: 'the hidden heart' of rural and regional health in Australia. *Rural and Remote Health*, 10, 1402.

Rourke, J.T., Incitti, F., Rourke, L.L., & Kennard, M. (2003). Keeping family physicians in rural practice: solutions favoured by rural physicians and family medicine residents. *Canadian Family Physician*, 49, 1142-1149.

Rural Doctors Association of Australia. (2012). Meeting the health needs of rural and remote Australia through an integrated strategic framework – an Advanced Rural Training Program. RDAA, Canberra.

Russell, D.J., Humphreys, J.S., McGrail, M.R., Cameron, W.I., & Williams, P.J. (2013a). The value of survival analyses for evidence-based rural medical workforce planning. *Hum Resour Health*, 11, 65.

Russell, D.J., Wakerman, J., & Humphreys, J.S. (2013b). What is a reasonable length of employment for health workers in Australian rural and remote primary healthcare services? *Aust Health Rev*, 37, 256-261.

Russell, L. (2013). Primary care and general practice in Australia 1990-2012: A chronology of federal government strategies, policies, programs and funding. Canberra: Australian Primary Health Care Research Institute.

Ryan, M., & Skatun, D. (2004). Modelling non-demanders in choice experiments. *Health Economics*, 13, 397-402.

Scott, A., Witt, J., Humphreys, J.S., Joyce, C., Kalb, G., Jeon, S.-H., et al. (2013). Getting doctors into the bush: General Practitioners' preferences for rural location. *Social Science and Medicine,* 96, 33-44.

Veitch, P.C., & Crossland, L. (2005). Medical family support needs and experiences in rural Queensland. *Rural and Remote Health*, 5, 467.

Viscomi, M., Larkins, S., & Sen Gupta, T. (2013). Recruitment and retention of general practitioners in rural Canada and Australia a review of the literature. *Canadian Journal of Rural Medicine*, 18, 13-23.

World Health Organization. (2010). Increasing access to health workers in remote and rural locations through improved retention: Global policy recommendations. Geneva: WHO.

Yan, W., Li, J., Scott, A., Sivey, P., Cheng, T., & Leahy, A. (2012). MABEL User Manual: Wave 4 Release. In U.o.M. Melbourne Institute of Applied Economic and Social Research (Ed.). Melbourne.

Table 1: Retention attributes and Levels for DCE

Retention attribute	Levels of Attributes
Locum relief guarantee	No paid locum relief Guaranteed paid locum 4 weeks in 12 months Guaranteed paid locum 6 weeks in 12 months
GP retention payments	No change in retention payments 25% increase in payments 50% increase in payments
Rural skills loading	No rural skills loading 10% procedural and emergency/on-call rural skills loading 20% procedural and emergency/on-call rural skills loading
Family isolation	No secondary school costs paid 50% secondary school costs paid for children boarding away from home 100% secondary school costs paid for children boarding away from home

Table 2. Regression results of Model 1 with a mixed logit model

Attribute	**Level**	Mixed logit model	
		Mean	SD
Locum relief guarantee (No paid locum relief)	paid locum 4 weeks in 12 months	0.854***	0.572
	paid locum 6 weeks in 12 months	1.509***	1.467***
GP retention payments (No change)	25% increase	0.454***	0.947***
	50% increase	1.360***	1.117***
Rural skills loading (No procedural and emergency/on-call rural skills loading)	10% skills loading	0.325***	0.404**
	20% skills loading	0.821***	0.939***
Family isolation payment (No secondary school costs paid)	50% costs paid	-0.123	0.009
	100% costs paid	0.191*	1.735***
Alternative-specific constant (Neither, Option A/B is reference category)		5.006***	7.795***
Number of observations		14955	
Number of individuals		1117	
Log-likelihood		-3268.445	
AIC		6572.89	
BIC		6709.92	
Wald chi-squared (df)		127.23 (18)***	

Notes: ***=p<0.001, **= 0.001<p<0.05, *=0.05<p<0.10. Attributes are effects coded.

Table 3. Predicted probabilities of hypothetical scenarios based on Model 1

	Scenario A	Scenario B	Scenario C	Scenario D	Scenario E	Scenario F	Scenario G	Scenario H	Scenario I	Scenario J
Attributes										
Locum relief guarantee	None	4 weeks in 12 months	6 weeks in 12 months	None	None	None	None	None	None	6 weeks in 12 months
GP retention payments	No change	No change	No change	25% increase	50% increase	No change	No change	No change	No change	50% increase
Rural skills loading	None	None	None	None	None	10% rural skills loading	20% rural skills loading	None	None	20% skills loading
Family isolation payment	None	None	None	None	None	None	None	50% costs paid	100% costs paid	100% costs paid
Predicted probabilities										
Neither option	0.734	0.586	0.553	0.629	0.587	0.669	0.644	0.732	0.707	0.330
Option A	0.266	0.414	0.447	0.371	0.413	0.331	0.356	0.268	0.293	0.670

Table 4. Regression results for Model 2: modelling GPs' choices of "Neither"

Attribute	Level	Mean	SD
		Coef.	Co ef.
Locum relief guarantee (No paid locum relief)	paid locum 4 weeks in 12 months	0.909***	0.407
	paid locum 6 weeks in 12 months	1.695***	1.581***
GP retention payments (No change)	25% increase	0.427***	0.971***
	50% increase	1.414***	1.074***
Rural skills loading (No skills loading)	10% skills loading	0.310***	0.587***
	20% skills loading	0.931***	0.951***
Family isolation payment (No secondary school costs paid)	50% costs paid	-0.041	0.411
	100% costs paid	0.220*	1.879***
Alternative-specific constant and interactions			
ASC (Neither, Option A/B as reference category)		2.333	7.352***
ASC*GP NOT subject to practice location restriction		-0.713	
ASC*Foreign trained (=1)		0.859	
ASC*GP gender (female=1)		0.430	
ASC*GP age		0.146***	
ASC*Number of years GP lived in rural area until leaving secondary school		-0.042	
ASC*Number of dependent children		-0.520**	
ASC*GP currently working in a hospital setting		-1.188*	
ASC*Salaried position		1.001	
ASC*Total working hours per week		-0.034	
ASC*Frequent on-call ratio		-2.177**	
ASC*Moderate on-call ratio		-2.116***	
ASC*Small rural area		-1.077	
ASC*Remote rural area		-1.931*	
Number of observations		12237	
Number of individuals		912	
Log-likelihood		-2631.28	
AIC		5324.568	
BIC		5554.346	
Wald chi-squared (df)		2194.62 (31)	

Notes: ***=p<0.001, **= 0.001<p<0.05, *=0.05<p<0.10. Attributes are effects coded.

Table 5. Regression results of Model 3 with a mixed logit model

Attribute	Level	Mean	SD
		Coef.	Coef.
Locum relief guarantee (No paid locum relief)	paid locum 4 weeks in 12 months	0.648***	-0.417
	paid locum 6 weeks in 12 months	1.624***	1.457***
GP retention payments (No change)	25% increase	0.387***	0.959***
	50% increase	1.423***	1.069***
Rural skills loading (No skills loading)	10% skills loading	0.255**	0.546***
	20% skills loading	0.363**	0.861***
Family isolation payment (No secondary school costs paid)	50% costs paid	-0.373**	-0.310
	100% costs paid	-0.166	1.698***
Alternative-specific constant (Neither, Option A/B as reference category)		4.638***	7.560***
		Mean	**Joint Chi-sq test**
Interaction terms		**Coef.**	**test statistics**
50% school costs paid*with dependent children		0.376**	14.960***
100% school costs paid*with dependent children		0.554**	
10% skills loading*working in hospital		0.096	32.520***
20% skills loading*working in hospital		0.926***	
paid locum 4wks/12 months*frequent on-call		0.308	6.590
paid locum 6wks/12 months*frequent on-call		0.509**	
paid locum 4wks/12 months*modest on-call		0.065	
paid locum 6wks/12 months*modest on-call		0.248	
paid locum 4wks/12 months*small rural		0.228	5.170
paid locum 6wks/12 months*small rural		-0.377	
paid locum 4wks/12 months*remote rural		0.262	
paid locum 6wks/12 months*remote rural		-0.253	
Number of observations		12954	
Number of individuals		967	
Log-likelihood		-2785.13	
AIC		5630.268	
BIC		5854.343	
Wald chi-squared (df)		165.1 (21)	

Notes: ***=p<0.001, **= 0.001<p<0.05, *=0.05<p<0.10. Attributes are effects coded.

Table 6. Predicted probabilities across subgroups defined by dependent children status, hospital working setting

Scenarios	No new incentives: zero level at all attributes	Highest level at all attributes	Middle level at the attribute in interaction, zero at other attributes	Highest level at the attribute in interaction, zero at other attributes
Interaction between	*Family isolation compensation x dependent children status*			
Whole sample	0.2764	0.6978	0.2815	0.3068
With dependent children	0.2773	0.7151	0.2992	0.3264
Without dependent children	0.2731	0.6563	0.2414	0.2624
Interaction between	*Rural skills loading x working in hospital setting*			
Whole sample	0.2764	0.6978	0.3428	0.3684
Working in hospital	0.2797	0.7363	0.3734	0.4199
Not working in hospital	0.2720	0.6586	0.3129	0.3195

Figure 1. Sample questionnaire of the DCE

Potential influences on decision-making:

- The following questions outline two different job support options.
- Each job support option comprises the same four key elements, but with differing characteristics.
- You will also have the opportunity to indicate if neither option would influence your decision to stay in a rural or remote community.

Please state which option (A or B) would most strongly influence how long you continue in practice in a rural or remote community.

8. Which option (A or B) would you prefer? (Please tick one box only)

	Option A		Option B
Locum relief guarantee	Guaranteed paid locum 6 weeks in 12 months		Guaranteed paid locum 4 weeks in 12 months
GP retention payments	25% increase in payments		50% increase in payments
Rural skills loading	No rural skills loading		10% procedural and emergency/on-call rural skills loading
Family isolation	No secondary school costs paid		No secondary school costs paid

☐ Neither option would influence my decision to stay ☐ Option A ☐ Option B

9. Which option (A or B) would you prefer?

	Option A		Option B
Locum relief guarantee	Guaranteed paid locum 6 weeks in 12 months		Guaranteed paid locum 4 weeks in 12 months
GP retention payments	50% increase in payments		No change in retention payments
Rural skills loading	10% procedural and emergency/on-call rural skills loading		No rural skills loading
Family isolation	100% secondary school costs paid for children boarding away from home		50% secondary school costs paid for children boarding away from home

☐ Neither option would influence my decision to stay ☐ Option A ☐ Option B

Research highlights

- We examine rural doctors' preferences for different rural retention incentives.
- A discrete choice experiment is used to examine doctors' preferences.
- Locum relief incentive, retention payments and rural skills loading are effective.
- Locum relief incentive is the most effective policy in rural retention.
- Retention payments policy is more effective than rural skills loading.

Author/s:
Li, J; Scott, A; McGrail, M; Humphreys, J; Witt, J

Title:
Retaining rural doctors: Doctors' preferences for rural medical workforce incentives

Date:
2014-11-01

Citation:
Li, J., Scott, A., McGrail, M., Humphreys, J. & Witt, J. (2014). Retaining rural doctors: Doctors' preferences for rural medical workforce incentives. SOCIAL SCIENCE & MEDICINE, 121, pp.56-64. https://doi.org/10.1016/j.socscimed.2014.09.053.

Persistent Link:
http://hdl.handle.net/11343/113566

File Description:
Accepted version