3. Comparing like with like: analysis by income

An essential step in comparing like with like is to adjust family income for family size and composition in order to take into account differences in the costs of living. This is particularly important when comparing the per capita health expenditure of Indigenous and non-Indigenous Australians by income level due to substantial differences in the size and structure of households between the Indigenous and non-Indigenous populations.

There is an ongoing and unresolved debate regarding appropriate equivalence scales for use in Australia (Saunders 1994). In the present analysis, the major challenge is to ensure that the distinctive circumstances of Indigenous people are taken into account in any reform of widely used equivalence scales (Altman & Hunter 1998).

Use of the 1995 NHS as a common data source for income equivalence and estimates of expenditure enables the calculation of all-important standard errors on the estimates of health expenditure by income. However, this introduces certain constraints on the analysis, and a discussion of these is provided.

Estimating access to resources using equivalent income

One important dimension of the capacity of Indigenous people and families to pay for health expenditure is family or household income. In order to calculate the resources available for improving health, one must appreciate the overall demands on resources within a family or household. There is no consensus on how this should be done, and several standard techniques exist to adjust family income to allow for the different number and characteristics of family members—that is, to apply an equivalence scale.[4] Note that while equivalence scales are standard tools in poverty analysis, they will be used in this report to provide an indication of the overall access to resources within families, some of which could potentially be spent on health services.

As indicated above, the NHS provides income data adjusted using the ABS's version of the simplified Henderson equivalence scales. However, this is only one of several scales available and, as noted, there is an ongoing controversy about the precise specification of equivalence scales. This revolves around the nature and extent of economies of scale in families or households—the smaller the proportion of expenditure on items which display economies of scale, the more justifiable it is simply to divide family or household income by the number of people it supports (Guobao, Richardson & Travers 1996). When income levels are very low, a high proportion of expenditure is on food, basic clothing, cooking fuel and certain health expenditures. Given that each of these varies directly, and quite closely, with the number of people in the family, it may make it appropriate to give each person a similar weight by focusing on per capita income. In contrast, where so-called 'public goods' (i.e. where a certain expenditure improves the well-being of all residents and not only the person consuming the resources) are important, such as in various categories of health expenditure, more account needs to be taken of potential economies of scale implicit in the equivalence scales. At the extreme, raw income measures implicitly

assume that extra family members cost no more to maintain than the first person. While this assumption is obviously untenable, it provides a useful bound on possible assumptions about economies of scale.

The point to note from this sensitivity analysis is that the relationship between health expenditure and income is likely to be distorted through measures of income which do not adjust for the number and age of people living off that income.[5] The per capita equivalence scales overestimate the needs of larger families in comparison with smaller families (De Vos & Zaidi 1997). In contrast, the use of raw income underestimates the needs of such families. The equivalence scales used in this paper cover the majority of possible assumptions about household costs, ranging from there being no extra cost to additional persons living in the family to there being no economies of scale in people living together. Given the preponderance of larger families in the Indigenous population the analysis of Indigenous health expenditure may be particularly sensitive to the type of income measure used.

Another tension implicit in choosing the appropriate equivalence scale for Indigenous income units is that the definition of the appropriate unit of analysis is not obvious in the Indigenous context (Altman & Hunter 1998). The widely used Henderson equivalence scales may be appropriate for a nuclear family, but it is more difficult to rationalise their use when Indigenous households can be characterised as having: compositional complexity; porous social boundaries and large size; extended families resident in one or more dwellings; households being subject to considerable fluctuation; and small, multi-generational core(s), dissolving and reforming in developmental cycles (Altman et al. 1997). Hunter and Smith (2000) have argued that focusing on households, rather than families, makes comparisons between Indigenous and non-Indigenous populations particularly problematic, especially when using the standard ABS definitions. Because of the conceptual difficulties in measuring income in a cross-cultural context, this paper uses a variety of equivalence scales on family income to capture the likely sensitivity of results to the underlying assumptions about economies of scale and access to resources.[6]

The income measures are calculated for income units (i.e. families) using four equivalence scales: raw income, the Henderson scale, the new OECD scale and per capita income.[7] Raw income is simply the sum of income of family members. The other income measures adjust for the size and composition of families by dividing this raw income by their respective equivalence scale.

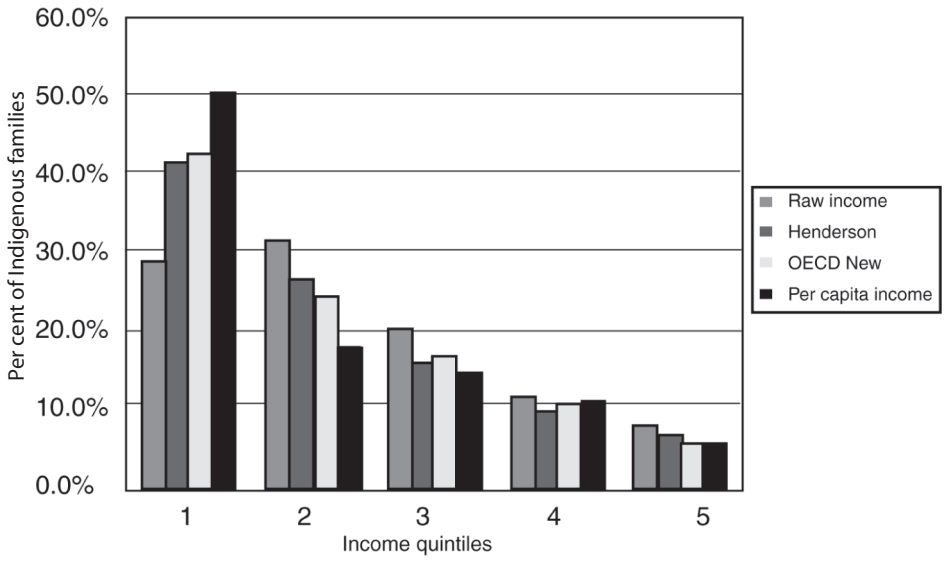
While Henderson's scale has been the standard measure for equivalent income in Australia since the mid-1970s, there is increasing criticism of the robustness of the resulting estimates (Henderson 1975; Saunders 1994; Travers & Richardson 1993). Accordingly, two extra measures of equivalent income are included to explore the feasible range of access to resources. However, Henderson's scale does have the advantage that it is the only scale to attempt to control for extra costs incurred by working or looking for a job. This adjustment is likely to be particularly important when comparing estimates of Indigenous and other Australians, given the enormous disparity in employment rates between these groups (Taylor & Hunter 1998).

Another equivalence scale widely used in international studies of poverty is the OECD scale. This paper uses the new or modified OECD scale, which gives a weight of one to the first adult, 0.5 to the second and subsequent adults, and 0.3 to all dependants (see De Vos & Zaidi 1997 for further details of the history of the OECD equivalence scales).

The last income measure used is per capita family income. This is calculated by dividing the raw income by the number of people in a family. The advantage of using these four income measures is that they cover the range of possibilities of economies of scale and access to resources. As discussed above, raw income and per capita income provide the extreme bounds of possible assumptions, with the Henderson and new OECD measures falling somewhere within these bounds. While the Henderson and new OECD scales probably provide more feasible estimates of access to resources, the sensitivity analysis needs to test whether our results are robust to all possible measures. Note that Fig. 3.1, and all subsequent analysis, reports the equivalent income measures in descending order of implicit economies of scale: raw income, the new OECD scale, the Henderson scales and per capita income.[8]

Income quintiles for these four different measures of income were estimated from the 1995 NHS separately for the Indigenous and non-Indigenous components of the population (Fig. 3.1). Each estimate is ranked according to its place in the overall distribution of the respective measures of equivalent income in the 1995 NHS. That is, the income quintiles used in this paper are measured for the Australian population using NHS 1995 data. Accordingly, the non-Indigenous distribution, which dominates the overall income distribution, is even, with 20 per cent being in each quintile.

Fig. 3.1 Distribution of equivalent income, Indigenous families



Source: NHS 1995, Appendix tables B1, B3, B5, and B7.

In line with Deeble et al. (1998), Fig. 3.1 illustrates that Indigenous people are disproportionately concentrated in the low income groups. As this earlier study only reported the distribution of equivalent income using a simplified Henderson scale, it is useful to compare this with other income distributions. One obvious point to make is that the per capita measure of equivalent income is even more concentrated in the low income group (at least, the bottom quintile). For example, per capita income is about 10 percentage points more likely to classify Indigenous families in the lowest quintile than the Henderson measure. On the other side, Henderson classifies over 10 per cent more of the Indigenous population in the bottom quintile than does raw income. Notwithstanding this, the overall shape of the distribution is similar, with most of the differences occurring in the first and second quintiles. The top two quintiles have very similar numbers of Indigenous families in all four income distributions.

Even though some of the overall income distributions in Fig. 3.1 do not differ much for the various measures of equivalent income, there are substantial reclassifications of families between the respective scales. Large families are more likely to be in the high quintiles of raw income, irrespective of living circumstances. While such families will tend to be reclassified in the lower income groups with the other equivalence scales (especially the per capita measures), other family types will be reclassified into higher income groups. The fact that Indigenous families are almost twice as likely to have a sole parent than other families with children complicates the comparisons between Indigenous and other Australian families (Daly & Smith 1998a; Daly & Smith 1998b). The extent of reclassification of family income depends crucially upon the number of children in the family and the assumption made about the relative costs of children and adults for the respective equivalence scales (Hunter, Kennedy & Smith 2001).

The age profiles of the various income groups can affect the interpretation of an income-based analysis.[9] For example, if low income groups include disproportionate numbers of older people, who would be more likely to be sick irrespective of their income status, then improvements in health as one moves up the income distribution may be driven as much by demographic factors as by differential access to resources or information. A brief perusal of age profiles by income reveals that this is the case for almost all measures of equivalent income used in this report, especially for the non-Indigenous population. The exception is per capita income, where the bottom quintile group has relatively few people aged 55 years or more (four times fewer than in the second quintile). The likely reason for this is that per capita income tends to re-rank small families at the end of the lifecycle (i.e. where the children have left home) into high-income quintiles compared with large families with many dependants. Whatever the reason, the fact that the age profile differs across income measures means that if the following analysis points to consistent differentials, irrespective of the equivalence scale, then it is possible to rule out that the analysis is driven by demographic factors.

Detailed analysis of the NHS income data indicates that there is substantial re-ranking of families or income units across income quintiles, with as many as one-third of families changing income group when different equivalence scales are used (Hunter, Kennedy & Smith 2001). Given the substantial reclassification of income groups for both Indigenous

and non-Indigenous populations, it would be surprising if the analysis of health expenditure was not sensitive to the choice of equivalence scales. Exploration of these effects provides for a more sophisticated treatment of income than was possible in Deeble et al. (1998) and yields greater insight into the relationship between income, health status and expenditure.

Estimating per capita health expenditure by income—method and data issues

Method

In principle the best way to obtain estimates of per capita health expenditure by income is to collect individual-level information on the usage and associated costs of medical services, income, Indigenous origin, age and gender. Unfortunately no such Australian data exist, and we are therefore forced to combine estimates of utilisation rates of health services from the 1995 NHS with the average costs of medical services estimated from a variety of administrative and survey data sources.

The method used involves merging onto the 1995 NHS, at the level of each individual record, estimates of the average cost of medical services. This produces, for the individuals in the NHS survey, estimates of the expenditure associated with the medical services they used in the two weeks prior to the survey. Using the estimated expenditure and information on each respondent's equivalent income, it is straightforward to estimate average per capita health expenditure for Indigenous and non-Indigenous Australians.

There are two sources of sampling errors associated with the estimates of per capita health expenditure. First, there is sampling error associated with the estimates of utilisation rates of health services from the 1995 NHS. Second, there are errors in the estimates of the average cost per medical service. The standard errors of the estimates of the utilisation rates are calculated using the 'jackknife' method.[10] Unfortunately, no information is available on the standard errors of the estimates of the average cost per medical service. Given that such costs are estimated from data which relate to a substantial proportion of the total population, it is reasonable to assume that the sampling variability from this source is extremely small. Notwithstanding, the standard errors of the estimates of per capita health expenditure presented in this paper provide a lower bound estimate.

The method of estimation of per capita health expenditure by income differs in a number of respects from that used in a previous analysis of this relationship. Deeble et al. (1998) estimated total and government health expenditure by age and gender, and then allocated this expenditure across equivalent income quintiles using differences in average rates of utilisation of health services for income groups.[11] The analysis by income group was only done for the total Australian population. Overall Indigenous public health expenditure was then compared with the estimates for the total Australian population for the respective income groups. The argument was made that Indigenous people are predominantly in the lowest income group and that per capita health expenditure should be compared with government health expenditure on the lowest income group for the total Australian population.

As outlined above, the estimates presented in this report are constructed by combining estimates of the average costs per medical service (estimated primarily from administrative data sources) and utilisation rates estimated from the 1995 NHS. The analysis is conducted at the level of the individual, and so no allocation of total health expenditure across income groups is required. The main advantage of the approach used in this report is that it allows standard errors on the estimates of health expenditure by income. As will become apparent when the results are presented, the standard errors are very high, and conclusions drawn about differences in health expenditure which ignore the standard errors may be grossly misleading.

Data

The 1995 NHS contains information on 53 751 Australians of all ages and is representative of those living in all areas. There is information on the rates of utilisation of a variety of health services but no information on the costs of these services. The NHS also contains information on income and a range of demographic variables. The following health services are included in the estimates of per capita health expenditure by equivalent income:

- out-of-hospital visits to general practitioners or medical specialists;
- other health professionals;
- admitted hospital patient;
- non-admitted hospital patient;
- prescription medications; and
- over-the-counter medications.

The range of medical services included in the estimates of expenditure is determined by the questions asked in the 1995 NHS. More information on the definition of each medical service is presented in Appendix A.

As indicated above, the analysis of health expenditure by income uses four equivalence scales to derive separate measures of equivalent income:

- raw family income;
- Henderson;
- OECD (new); and
- per capita income.

Income quintiles for these four different measures of income were estimated from the 1995 NHS separately for the Indigenous and non-Indigenous components of the population. Each family's income is ranked using the overall distribution of equivalent income in the 1995 NHS. Given that the number of Indigenous families in some of the higher quintiles is quite small, it is necessary to aggregate the top four quintiles to enhance the reliability

of the estimates.[12] The numbers of people in the respective quintiles are provided for each measure of equivalent income in Appendix B.

In the interests of transparency (i.e. to ensure that the results are replicable), Appendix C provides detailed breakdowns of all the costs per service for medical services used in this report. As discussed, these estimates were provided to CAEPR by AIHW and are derived from a variety of administrative data sources. Where possible, the estimates of cost per medical service are estimated according to Indigenous origin, gender and age group. The level of disaggregation in the estimates of cost per service varied according to what is feasible, given the administrative data available (see Table 3.1 for details of the level of disaggregation for each category of medical service). Where no disaggregation is possible, it is necessary to assume that the cost per service is identical across age groups, gender and Indigenous origin. The medical services for which disaggregated cost data are available are admitted patients, visits to general practitioners and specialists, and prescription medications.

It is important to estimate cost per medical service by as detailed a gender, age and Indigenous origin breakdown as possible due to differences in the average cost per service by demographic characteristics. The importance of this is illustrated by the differences in the estimated costs per service for admitted patients; these vary from $478 per day in hospital for Indigenous males aged 75 plus years to $900 per day in hospital for non-Indigenous females.

Table 3.1 Level of disaggregation of costs per medical service for each type of medical service

Medical service	Level of disaggregation of estimates of cost per service
Admitted patients	By Indigenous origin, gender and 10-year age groups
Non-admitted patients	Single estimate for population as a whole
Prescription medications	By Indigenous origin, gender and 10-year age groups
Over-the-counter medications	Single estimate for population as a whole
Other health professionals	Single estimate for population as a whole
General practitioners and medical specialists – out of hospital	By Indigenous origin and gender. For age groups 0–44 and 45+ for the Indigenous population and 10-year age groups for the non-Indigenous population.

Note: Unfortunately, it was not possible to further disaggregate the out-of-hospital estimates for the Indigenous population because it is based on a relatively small sample size (see endnote 13).

The medical services for which disaggregated cost data are available cover 78.7 per cent of all health expenditures included in this analysis. The inaccuracies introduced by the aggregated nature of the estimates of over-the-counter medications, non-admitted patients and other health professionals will be relatively minor. It is worth stressing that no information was provided on the standard errors associated with the estimates of cost per medical service. The standard errors, for at least some of the service types, are likely to be quite large. For example, the cost per visit to a GP for the Indigenous population is based upon information from 2000 Indigenous patient encounters. This means that the number of patient encounters in each of the gender and age groups is small for the Indigenous population.[13]

As already noted, unlike the analysis for the Australian population as a whole presented in Deeble et al. (1998), it is not possible to separate expenditure into the private and public components. There are several reasons for this, all associated with the quality of information available from the 1995 NHS. First, due to changes in the questions about rates of medical service utilisation between the 1989 and 1995 NHS, it is not possible to estimate government health expenditure by equivalent income quintile. The main change is that the 1989 NHS asked about hospital utilisation in the previous twelve months, whereas in 1995 the NHS asked about hospital utilisation in the previous two weeks. This means that there are not enough reported visits to private hospitals to allow utilisation rates of private and public hospitals by equivalent income to be estimated.

Second, the proportion of expenditure on prescription medications that is privately funded versus the proportion publicly funded is determined by several factors. Prescription medications listed on the PBS receive a government subsidy.[14] Prescription medications which are not listed on the schedule of PBS-approved drugs receive no subsidy, and therefore all costs are borne privately. Clearly, in order to estimate public versus private funding on prescription medications, it is crucial to separate medications according to those listed on the PBS schedule and those not listed on the PBS schedule. This is not possible using the 1995 NHS because it classifies medications according to their Anatomical Therapeutical Category, and this cannot be mapped onto PBS and non-PBS categorisation.

There are major advantages to the method used in this report to estimate per capita health expenditure by income. First, it allows standard errors to be calculated for the estimates. This is absolutely critical when interpreting the estimates of health expenditure per capita for the Indigenous population for whom the sample sizes are small. Second, it gives an accurate reflection of per capita expenditure for the sample used rather than applying the rates to aggregate data. This of course means that the estimated per capita expenditure will differ from the estimates of aggregate expenditure.