

Application of an integrated multidisciplinary economic welfare approach to improved wellbeing through Aboriginal caring for country

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Abstract. The lands held by Aboriginal people are mostly located in the Australian desert, aside from pastoral country purchased under the Indigenous Land Corporation, they are among the least amenable to agricultural production. Social expectations regarding land use are undergoing a multifunctional transition with a move away from a focus on production, to increased amenity and conservation uses. This change means that Aboriginal people with cultural connections to country enjoy an absolute advantage in managing country through their application of land care involving Indigenous ecological knowledge.

An integrated multidisciplinary economic welfare approach, based on data from northern Australia and the central Australian desert, is used to demonstrate the role Aboriginal people can play in caring for country. Such engagement can be to the advantage of Aboriginal people through a multiplicity of private and public good benefits, such as improving Aboriginal health, maintaining biodiversity, and the mitigation of climate change impacts through possible greenhouse gas biosequestration and the reduction of dust storms – which are an important vector of disease.

Additional keywords: closing the gap, desert, natural resource management, social determinants.

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Introduction

Indigenous Australians have jurisdiction over a significant area of country as a result of the enactment of the *Native Title Act (1993)* and land being returned to them in the Northern Territory and South Australia. While there is some uncertainty about the size of this area, estimates range up to 20% of Australia (Altman *et al.* 2007; p. 43), extending to 25.4% when non-exclusive rights are included (Lane and Williams 2008; p. 38). Most of this country is at best marginal grazing country, with all but ~0.2% in remote–very remote Australia (Altman *et al.* 2007). Demographic changes, resulting in a decreasing non-Aboriginal population and an increasing Aboriginal population with extensive land ownership in remote–very remote Australia (Brown *et al.* 2008), mean that there is an increasing land management role for Aboriginal people in this region.

Duncan (2003; p. 308) suggested that agricultural economists and farm managers play a significant role in advancing the economic wellbeing of Aboriginal Australians, given their large land holdings. He saw this as a step to overcoming the economic disadvantage suffered by Aboriginal people, but it is not surprising that there has been minimal follow-up on this suggestion. While Aboriginal people do run several successful grazing properties as, for instance, those set up by the Indigenous Land Corporation in Western Australia in cooperation with the

Western Australian Department of Agriculture and Food (ILC 2007), much of the land held by Aboriginal people is not only mostly desert but is also the least suitable for agricultural pursuits. As a result, the opportunities for Aboriginal people to overcome economic disadvantage through land ownership may seem limited. This need not be the case, as there is an important land management role for Aboriginal people in remote–very remote Australia using Indigenous ecological knowledge. Such activities can result in national economic public good benefits, in addition to private and community benefits for Aboriginal people (Campbell *et al.* 2008a).

Holmes (2006), building on the writings of earlier researchers such as Marsden (1999), Wilson (2001, 2004) and Evans *et al.* (2002), described the social expectations of land use as moving away from a focus on production to a multifunctional transition. This involves contestation among: (1) production, including agricultural production and mining; (2) amenity benefits, including tourism; and (3) protection, consisting of conservation and/or Aboriginal occupancy.

A multiplicity of benefits can be achieved through the involvement of Aboriginal people in land management according to Indigenous ecological knowledge, or ‘caring for country’. Caring for country involves practices such as spending time on country, removal of grasses through cool weather burning,

gathering of food and medicinal resources, participating in cultural activities including protection of sacred sites and the production of art and craft work (Burgess *et al.* 2008) and intergenerational transfer of knowledge (Burgess *et al.* 2008). Figure 1 presents some of the multiplicity of possible public and private benefits, of which the health of Aboriginal people is an important component. As the health of Aboriginal people is generally below the minimum national social standard (HREOC/SCIHE 2008; Rudd 2008; Rudd and Roxon 2008), raising their general level of health is a national economic public good.

It is important that such multiple benefits are included in any assessment of land management by using an integrated multidisciplinary economic welfare approach, such as proposed by Abler (2004) and Armbruster (2008). Armbruster suggested that there is 'a need to collaborate much more broadly with other researchers both inside and outside our [agricultural and resource economists] profession in order to achieve results meaningful to the complexity of the issues' (p. 1).

The purpose of this paper is to demonstrate the application of an integrated multidisciplinary economic welfare approach to assess improved economic wellbeing for Aboriginal people through caring for country. In particular, emphasis is given to economies achieved through the joint supply of health and environmental services by the private involvement of Aboriginal people in caring for country (Campbell *et al.* 2008a).

Background

Current health status

There have been minor improvements in the life expectancy of Aboriginal people over the past 20 years (Condon *et al.* 2004; Thomas *et al.* 2006; Zhao and Dempsey 2006; Wilson *et al.* 2007). However, as the national population has also enjoyed improvements in life expectancy over this time, the relative gap in life expectancy for Aboriginal people remains. Over the period 2005–07 the national life expectancy for Indigenous males was 67.2 years (a gap of 11.5 years) and for Indigenous females it was 72.9 years (a gap of 9.7 years). These figures show a longer life expectancy than earlier estimates provided by the Australian Bureau of Statistics. This is not the result of improvements in

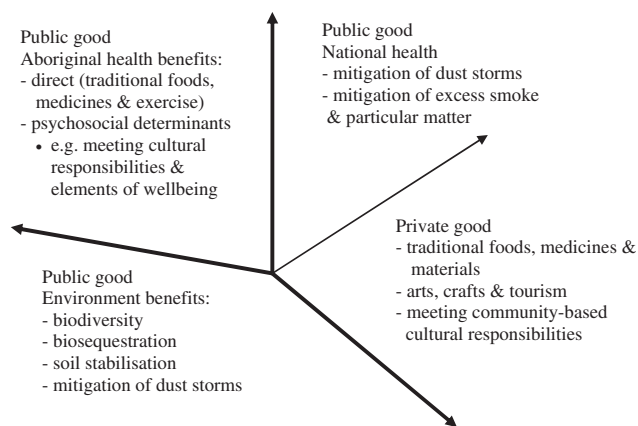


Fig. 1. Joint products originating from Aboriginal involvement through caring for country in remote–very remote Australia (based on Campbell 2008).

health outcomes for Indigenous Australians, but is the result of changes in the methodology used to estimate the expected life span of Indigenous Australians (Australian Bureau of Statistics 2008; Steering Committee for the Review of Government Service Provision 2009).

While the impact of communicable disease is important, more than 70% of Aboriginal mortality is the result of non-communicable diseases such as hypertension, diabetes and renal disease (Condon *et al.* 2004; p. 450; Zhao and Dempsey 2006). Although the factors affecting the high level of chronic disease among Aboriginal people are not fully understood (Cass *et al.* 2004), the psychological and social (psychosocial) determinants of health are important (Carson *et al.* 2007; Johnston *et al.* 2007a; Putnis *et al.* 2007; Marmot *et al.* 2008). Therefore, addressing the psychosocial determinants is fundamental to closing the gap in health outcomes. Addressing these factors through caring-for-country practices is likely to both complement biomedical interventions and result in scoping economies (Campbell *et al.* 2008a, 2011).

Connecting with country

An explanation of the interrelationship between Aboriginal health, caring for country, and the supply of environmental services starts with the arrival of non-Aboriginal settlers in central Australia some 130 years ago. These settlers observed an ecosystem that was the result of a history of caring for country by Aboriginal people, in which the use of fire was an important land management and hunting and gathering tool (Bird *et al.* 2005; Altman 2009). The use of fire normally occurred in the cooler months when it would have less impact on timber species than in the hotter months preceding the wet. These cool-weather fires led to a mosaic of burnt and unburnt areas and a complexity of plant species of varying ages (Edwards *et al.* 2008; Russell-Smith *et al.* 2009).

European settlement and the dispossession of Aboriginal people from country led to changes in land management practices, the introduction of exotic species, and ecological alterations (Gale and Haworth 2005; Lunt *et al.* 2007; Edwards *et al.* 2008). The resulting decrease in the mosaic of burnt/unburnt areas led to an increase in the occurrence, intensity and extent of wild fires over the drier, hotter months, and the release of biologically sequestered greenhouse gases due to the loss of woody plants (Edwards *et al.* 2008). The increase in smoke as a result of wild fires was also accompanied by localised increases in respiratory diseases (Johnston *et al.* 2007b). The reduction of vegetative cover can also result in increased frequency of dust storms with negative health impacts from siliceous disease and the dust acting as a vector of disease (Knight *et al.* 1995; Griffin *et al.* 2001; Campbell *et al.* 2008b).

The dispossession of Aboriginal people from their country resulted in the loss of access to traditional food and medicines, of cultural connection with country and of personal and group identity – with psychosocial impacts on Aboriginal health. Such impacts included the failure to meet cultural responsibilities on country, the breakdown of community customary governance structures, the loss of personal and group identity, and a loss of control over living as individuals and as members of a community (Carson *et al.* 2007; Johnston *et al.* 2007a; Garnett

et al. 2009). The trauma of invasion (Renolds 1992; Ashdown 2007), racism, social and economic disadvantage, and poor education and employment opportunities are also important in their effect on the psychosocial determinants of health (Anderson 2007; Saggars and Gray 2007). Due to the interrelationship between health and the capacity to care for country and the impact that the failing health of country has on Aboriginal health (Muir *et al.* 2010), in many areas there is a negative feedback loop leading to a downward spiral of poor ecological health of country and the health of Aboriginal people, which is leading to a net social loss (Campbell *et al.* 2008a).

The link with caring for country and improved health outcomes

There are two parts to this section. First, the benefits from the involvement of Aboriginal people in caring for country in the West Arnhem Land Fire Abatement Project are summarised. This includes both environmental benefits and an economic assessment of the savings in primary health care as a result of their engagement in caring for country (Campbell *et al.* 2011). Second, the results from the Arnhem Land case study are generalised to the central Australian desert on the basis of research carried out by McDermott *et al.* (1998).

West Arnhem Land case study

The West Arnhem Land data are the result of the Healthy Country Healthy People study carried out in Arnhem Land at the behest of the traditional owners (Garnett and Sithole 2007; Johnston *et al.* 2007b; Burgess *et al.* 2009). The study was intended to demonstrate a 'proof of concept' for the ancillary health benefits of participation in caring for country, and extends earlier work by Morice (1976), O'Dea (1984), O'Dea *et al.* (1988), McDermott *et al.* (1998) and Rowley *et al.* (2008).

Environmental benefits of caring for country

The West Arnhem Land region is recognised as containing Australia's largest grouping of natural ecosystems remaining in a natural state (Natural Heritage Trust 2009) – although use of the term 'natural' is misleading given the long history of occupancy and land management through caring for country by Aboriginal people. It has also been a region subject to intense annual dry season fires and smoke.

The West Arnhem Land Fire Abatement Project was initiated in 1997 and was intended to repopulate the region and counter the high incidence of wild fires in West Arnhem Land. The program included the involvement of Aboriginal people in land management practices using Indigenous ecological knowledge, and ecological studies of the impact of changing fire regimes on vegetative communities. A reduction in the release of greenhouse gases occurred as a result of the decrease in uncontrolled wild fires.

Conoco-Phillips were persuaded to make use of the reduction in greenhouse gas release in meeting the Australian and Northern Territory Governments' requirement for greenhouse gas offsets in establishing a liquefied natural gas plant in Darwin. The intended offsets are an average annual reduction of 100 000 tonnes of CO₂ equivalent over a 17-year period. The

program includes an annual payment of \$1 million for fire abatement services by traditional Aboriginal land owners through caring-for-country activities in conjunction with western land management methods (Whitehead *et al.* 2009).

A total reduction of 420 000 tonnes in greenhouse gas emissions occurred in the first 3 years of the project at a cost of less than \$10 per tonne of CO₂ equivalent (Whitehead *et al.* 2009). Additional biodiversity and social benefits also occur, along with new employment opportunities for the local Aboriginal community. Social benefits included cultural re-engagement with country, and environmental benefits including protection of *Allosyncarpia* rainforest and a range of other threatened species (Purdon *et al.* 2008; Tropical Savannas CRC 2008a, 2008b; Russell-Smith *et al.* 2009).

Expected savings in primary health care through caring for country

The following estimated cost savings in primary health care are from Campbell *et al.* (2011) using health and caring-for-country data collected by Burgess *et al.* (2009) and cost data from Zhao *et al.* (2006). These health data were collected from a targeted sample of 298 respondents aged 15–54 years. The study participants constitute 23.2% of an Arnhem Land Aboriginal community, who were recruited using targeted sampling. Survey participants' residences ranged from homelands (outstations) to the central township. Individual caring-for-country scores were assessed using a previously developed caring-for-country participation index (Burgess *et al.* 2008). The observed scores ranged from 6 to 24, of a possible 1–25, with a mean score of 15.17 (s.d. = 5.31). The index was based on six core activities: time on country, burning of grasses, gathering of food and medical resources, ceremony, protecting sacred areas, and artwork production.

Participants were clinically assessed for the risk and presence of chronic disease (Burgess *et al.* 2009). The association between the caring-for-country score and chronic disease status was investigated using multivariate regression. After controlling for sociodemographic characteristics such as age and gender, and health behaviours such as smoking and exercise, the likelihood of having a chronic disease condition was shown to decrease with increasing caring for country (Table 1).

The economic assessment (Campbell *et al.* 2011) was carried out according to the level of severity of three chronic disease conditions: hypertension, type 2 diabetes, and renal disease. The cost data used in this analysis was sourced from the Northern Territory Government's cost estimates for primary health care in remote Aboriginal communities for 2003–04 (Zhao *et al.* 2006; p. 27). The cost of district and centralised overheads, and the administration cost of remote healthcare centres were not included in the Zhao *et al.* data. The cost data were weighted using the Australian Bureau of Statistics medical consumer price index to give estimated 2008 values.

The estimated annual savings in primary health care for the study population of 1284 Aboriginal people, according to expected participation in caring for country, was \$268 000, with a present value estimated in constant 2008 dollar value over 25 years of \$4.08 million (Campbell *et al.* 2011). The present value estimate is based on a time discount rate of 4.075%,

Table 1. Multivariate regression model outcomes and annual primary care costs for three chronic diseases for the Arnhem Land Aboriginal community^A
 P* < 0.05; *P* < 0.01

Condition	Increasing disease severity/complexity				Caring for country	
	1 Cost (\$)	2 Cost (\$)	3 Cost (\$)	4 Cost (\$)	Coefficient ^B (95% CI)	Number with condition (% of total)
Hypertension	455	1022	–	–	–0.26* (–0.41 to –0.10)	19 (6)
Renal disease	49	347	2327	2466	–0.11* (–0.19 to –0.04)	95 (34)
Diabetes	1514	1586	–	–	–0.23** (–0.39 to –0.07)	22 (7)

^ACampbell *et al.* (2011).

^BChange in risk for a one-unit change in weighted caring for country score.

established according to standard Department of Finance and Administration (2006) criteria. No account was taken of primary care savings for other health conditions, hospital costs, or travel.

As caring for country constitutes a preventative health intervention, there are additional economic benefits through maintaining a healthier community. While no direct estimates of environmental benefits were assessed, the results of the greenhouse gas offsets, alone, indicate these are substantial.

Comparison with Aboriginal central Australia

The central Australian results are based on McDermott *et al.* (1998) data. The data were collected from two central Australian Aboriginal communities and categorised according to whether the respondent lived on traditional homelands, usually in a small family group, or in the central township. Those living on homelands had greater access and opportunity to carry out traditional practices and the collection of traditional foods and medicines. Those living in the central township had less access to traditional country and greater access to store bought food. As a result, homeland residents were more likely to exercise and have a healthier diet.

The comparative medical results are based on differences in individual body mass index (BMI), which is the individual’s bodyweight divided by the square of their height (kg/m²). Body mass index is a reliable indicator of chronic

disease risk for Aboriginal people (Wang and Hoy 2004). The central Australian data also include prevalence of diabetes and hypertension, by residence (Table 2). Equivalent Arnhem Land data, plus the Arnhem Land composite caring-for-country scores according to residence, are included in Table 2. Both the central Australian data and the Arnhem Land data showed a lower BMI reading and a lower prevalence of chronic disease for homeland residents.

The Arnhem Land composite caring-for-country scores were higher for those living on homelands than for those living in the township [2.61 (s.e. = 0.41), v. 1.58 (s.e. = 0.49)] (Burgess *et al.* 2009). This result also implies a positive relationship between living on homelands and participation in caring for country.

The McDermott *et al.* (1998) diabetes and hypertension disease data did not consider the severity of the health conditions. Nor were there data showing expected changes in chronic disease according to changes in caring for country. Instead, the relative difference in chronic disease according to residence was considered, where residence was a proxy for caring for country. These data, along with the cost data based on Zhao *et al.* (2006) were used to measure the cost savings in 2008 dollar values according to caring for country based on residence. Two estimates are provided according to severity level 1, and severity level 2. To provide comparative measures, the cost savings were estimated for a population of 1284, which is equivalent to the Arnhem Land study population

Table 2. Comparison of body mass index (BMI) according to location of residence in Arnhem Land and central Australia

Classification	Residence			
	Township		Homelands	
	Value (std. error)	No. of respondents	Value (std. error)	No. of respondents
Arnhem Land community ^A				
Composite caring-for-country score	1.58 (0.49)	191	2.61 (0.41)	89
Difference in caring-for-country score			65%	
BMI (kg/m ²)	23.2 (5.7)	195	22.4 (5.7)	93
Difference in BMI			4%	
Central Australian communities ^B				
Body (kg/m ²)	25.7 (6.1)	296	23.5 (5.7)	530
Difference in BMI scores			9%	
Diabetes	37 (13%)	294	46 (9%)	526
Hypertension	98 (33%)	293	108 (20%)	528

^ABurgess *et al.* (2009).

^BMcDermott *et al.* (1998).

Table 3. Expected savings in primary health care costs for diabetes and hypertension as a result of homeland residency in central Australia

Estimation of:	Diabetes		Hypertension	
	Homeland	Township	Homeland	Township
Cent. Aust. no. per 1000	87.452	125.850	204.545	334.471
Difference in no. affected	38.398		129.925	
Unit cost severity level 2	\$1709.53		\$1102.07	
Total cost per 1000	\$65 642		\$143 187	
Total cost equivalent to a population of 1284 ^B	\$84 285		\$183 852	
Total cost difference for severity level 2	\$268 137			
Unit cost severity level 1	\$1632.17		\$479.38	
Total cost per 1000	\$62 672		\$62 284	
Total cost equivalent to a population of 1284 ^A	\$80 471		\$79 972	
Total cost difference for severity level 1	\$160 443			

^AThese results are based on data from McDermott *et al.* (1998) and the same cost data as for the Arnhem Land cost estimates.

^BThe Aboriginal central Australia estimates are estimated for a community population of 1284 Aboriginal people, equivalent to the Arnhem Land population.

(Table 3). The annual cost savings in central Australia were estimated to range from \$160 443 to \$268 137. By comparison, the total Arnhem Land annual expected cost savings for diabetes and hypertension was \$192 030 (Table 3).

Discussion

The Arnhem Land results show that homeland residents have higher levels of caring-for-country scores, lower BMI readings, and lower prevalence of chronic disease than township residents. The Arnhem Land cost savings were based on an expected variation in chronic disease resulting from a mean measured variation in caring-for-country score of 15, from an observed range of 6 through 24 units. No such estimation was possible for central Australia. Instead, estimated cost savings were provided according to the difference in BMI between township residents and homeland residents, where residence was used as a proxy for caring for country. Obviously, these are not equivalent measures as (1) the Arnhem Land estimated cost savings were based on the existing number of people with three chronic diseases conditions following participation in caring for country; and (2) the use of the caring-for-country score provides a better estimate of caring for country than residential location.

The central Australian and Arnhem Land results provide both a lower risk and a lower rate of chronic disease for homeland residents. Both measures are indicative of the incidence of chronic disease. Homeland residency provides greater access to caring-for-country activities, as indicated by the difference in the Arnhem Land caring-for-country scores. Two inferences can be drawn from these results. First, Aboriginal people living on homelands in remote–very remote Australia are more likely to participate in caring for country with consequent environmental benefits. Second, participation in

caring for country is strongly associated with lower chronic disease risk and lower rates of chronic disease.

One possible explanation for the lower BMI readings and lower disease prevalence for those living on homelands is that homeland residents in poor health move to the township to access health services. However, this behaviour is contradicted by the Rowley *et al.* (2008) results from a 10-year follow-up of one of the study populations in the McDermott *et al.* (1998) study, where it was shown that unhealthy people did not move off homelands to settlements. This result is also inconsistent with Aboriginal people reporting that they feel healthier as a result of moving to homelands and living in a traditional lifestyle when unwell (Morice 1976; Johnston *et al.* 2007a; Kingsley *et al.* 2009).

Environmental benefits of caring for country

Over 20 million hectares are managed under Indigenous Protected Area programs established by the Commonwealth Department of the Environment, Water, Heritage and the Arts (now the Department of Sustainability, Environment, Water, Population and Communities). This is one-quarter of the national reserve program and can be assumed to provide appropriate environmental benefits as required under the *Environment Protection and Biodiversity Conservation Act (1999)*. These areas have been managed according to Indigenous ecological knowledge by resident Aboriginal communities. The use of Indigenous Protected Areas provides some financial assistance in the maintenance of these areas while meeting national environmental protection requirements are at a lower cost than would otherwise be achieved.

In 2008 the Department increased funding for the Indigenous Protected Area program to \$180 million over 5 years. The intention was to increase the Indigenous Protected Area by at least 40% by the end of the funding grant (Commonwealth Department of the Environment Water Heritage and the Arts 2010). Consistent with the distribution of the land held by Aboriginal people, Indigenous Protected Areas are overwhelmingly located in remote–very remote areas, where most of this area is desert [see map: Indigenous Protected Areas May 2010; Department of the Environment Water Heritage and the Arts/Department of Agriculture, Fisheries and Forestry (2010)].

The activities involved in caring for country result in private and Aboriginal community benefits and national public good benefits. The public good includes the improved health of Aboriginal people and a range of other benefits (see Fig. 1) including national health benefits due to the possible mitigation of dust storms from desert Australia. Such benefits are additional to the environmental benefits accounted for by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities in their funding of Indigenous Protected Areas.

Scoping and complementary economies

Two economic characteristics important to understanding the cost effectiveness of caring for country by Aboriginal people are scoping economies and complementary economies.

Scoping economies

Scoping economies occur when the cost of providing two or more goods jointly is less than they would cost if they were to be supplied separately. That is:

$$((TC_E + TC_H) - TC_{E,H})/TC_{E,H} > 0 \quad (1)$$

where TC_E is the total cost of supplying a given amount of environmental services when it is supplied separate of health services.

TC_H is the total cost of supplying a given amount of health services when it is supplied separate of environmental services.

$TC_{E,H}$ is the total cost of supplying a given amount of environmental and health services when they are provided jointly.

Scoping economies come about when two or more products share at least one common input and the long-run marginal gain in efficiency in production of the additional product/s exceeds any long-run marginal loss of efficiency in the production of the existing product/s. Participation in caring for country is assumed to occur up to where the Aboriginal community's marginal benefits equal the marginal opportunity cost. As the marginal national social benefit of the enhanced environmental and health-related public goods resulting from caring for country are unaccounted for, that is, are external to the Aboriginal community's decision making, they will be under supplied. Using Black's (1990) cost effectiveness plane, extended by Pannell (2008) in the natural resources literature, Campbell *et al.* (2008a) have argued for public funding of Aboriginal caring-for-country activities. Such funding is applicable when the combined public and private benefits exceed what would be supplied by Aboriginal people under their own initiative.

The estimated annual cost savings in primary health care of \$258 000, for the Arnhem Land Aboriginal community is a direct result of the community's involvement in caring for country. These savings are in addition to environmental and other benefits. As noted, many of the public benefits obtainable through the involvement of Aboriginal people in caring for country are external to the decisions made by Aboriginal people.

Substitution or complementary economies?

Whether substitution or a complementary relationship applies is normally identified by whether compensated cross elasticities of supply (e_{xy}) is positive, in the case of substitution effects, or negative, in the case of complementary effects. That is, complementarities exist when:

$$e_{xy} = (\Delta Q_x/Q_x)/(\Delta P_y/P_y) < 0 \quad (2)$$

and substitution exists when:

$$e_{xy} = (\Delta Q_x/Q_x)/(\Delta P_y/P_y) \geq 0$$

where: ΔQ_x is the change in the quantity of x supplied. Q_x is the original quantity of x supplied. ΔP_y is the change in the price of Y . P_y is the original price of Y .

The failure to meet complementary economies results in a net social loss due to technical inefficiencies. There is limited direct evidence of the effectiveness of caring for country as a complement to biomedical inputs. Burgess *et al.* (2008), however, observed decreased psychological stress in line with

increased caring for country. In addition, there is substantial general argument and supporting evidence that the psychosocial determinants of health are complementary inputs to biomedical inputs (Carson *et al.* 2007; Marmot *et al.* 2008; Commission on Social Determinants of Health 2009).

Conclusion

An integrated multidisciplinary economic welfare approach has been used to demonstrate the possible improved economic wellbeing of Aboriginal people and of the public good through culturally acceptable participation in caring for country. While a range of public good and private benefits are identifiable, the focus in this paper has been on the two national policy issues of environmental management and closing the gap in Aboriginal health. Possible national benefits, in addition to the private benefits Aboriginal people might obtain, are demonstrated.

If psychosocial benefits for Aboriginal people are to be achieved, it is necessary that caring for country is carried out by people who are indigenous to that country. Accordingly, Aboriginal people have an absolute advantage in the application of Indigenous ecological knowledge in their country. Such activities are likely to result in scoping economies through the joint supply of health and environmental benefits that occur as a result of the cultural connection of Aboriginal people with country. In addition, it is likely that the psychosocial benefits of caring for country will complement biomedical inputs in closing the health gap.

While the research on which this paper is based may be criticised, there are several studies that support the inferences drawn here. Although these results are not conclusive, they provide input into the public discussion regarding the establishment of centralised settlements for Aboriginal people. They also highlight the need for a broad-based time series research on the environmental and health benefits of Aboriginal people's involvement in caring for country. Such work would complement and extend the cross-sectional data on which this paper is based.

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