

The impacts of transport accessibility and remoteness on Australian Football League (AFL) talent production: findings from the ‘Talent Tracker’ project

Dr Matthew Burke¹ and Assoc Prof Geoff Woolcock¹

¹ Urban Research Program, Griffith University, 170 Kessels Road, NATHAN QLD 4111

Email for correspondence: m.burke@griffith.edu.au

Confidentiality

This paper is provided for review purposes only and is not for further distribution. The Talent Tracker results are not as yet in the public domain and a dissemination strategy is being developed with the AFL as part of the ARC-Linkage Project that underpins the work. Methods and results, including mapping and tables, provided in this paper are not to be disclosed to other parties without the written permission of the authors.

Abstract

Does transport accessibility influence how many elite sportspersons regions produce? Accessibility and remoteness research has proliferated in the era of geographic information systems (GIS), but seldom within sports research. Studies in Australia and the US reveal that sports talent is more likely to come from communities of less than 500,000, but more than 10,000 people, suggesting spatial accessibility effects. The *Talent Tracker* project has identified the junior region of origin for the 1,290 players who were drafted and played at least one game of senior Australian Football (AFL) in the period 1997-2010. Junior AFL participation data (13-18 year old males) for the same period is used to determine spatial measures of annual average ‘talent yield’ (draftees produced per junior participant). The results are matched with Accessibility/Remoteness Index of Australia (ARIA) data, which provides a measure of spatial accessibility via the road network, for all Statistical Local Areas in Australia. Limitations of the methods include possible areal errors through aggregation in both datasets. Statistical correlation results suggest an association between accessibility/remoteness and talent yield across the SLAs. Mapping outputs highlight particular problems for extremely remote locations. At a finer grain, the results produce a more intriguing picture of where the places are in Australia that have been over- and under-producing AFL players, raising further questions as to how transport may be an influential factor. The findings may help sports bodies better understand the necessary spatial conditions influencing both elite competition recruitment structures and access to elite coaching.

1. Introduction

Does transport accessibility affect sports player talent development? Can transport access or remoteness determine the likelihood of a region producing professional sports stars? Sports researchers wish to know how a multitude of factors affect athletic development, to assist with talent identification and to improve player development in future. But the question of how important transport access is, at the regional level, has not as yet been explored using empirical methods.

Major gaps in knowledge include the spatial arrangements of sports talent production, and the role transport accessibility might play. We know little about whether access to coaching, training and playing opportunities generates spatial variation in talent production. Access

may be especially problematic in rural and regional landscapes such as Australia's non-metropolitan regions. Understanding these concerns may help improve sports talent identification and development, particularly by influencing the management and organisation of junior sports and the spatial arrangements for coaching, training and competition.

The purpose of this research was to undertake the first analysis of transport accessibility and junior sports talent production as part of a broader project evaluating Australian approaches to TID¹. The essential thesis is that lesser transport access and increased 'remoteness' would be associated with lower rates of junior sports talent production.

The research used innovative methods to compile the first major dataset of professional football players by their place of junior development. It provides new means to conceptualize junior sports talent production and to operationalise spatial measures of regional performance in producing talent. And the research applies measures of access used widely in Australia to appraise whether there is any correlation with the talent data.

The paper commences with a review of the key research issues and the problems of accessibility research for such questions. The project is then introduced and its measures outlined. The case study is introduced and the accessibility measures outlined. The key outputs include tables of sports talent production and a measure of accessibility, disaggregated at regional level, and the results of regression analysis comparing the two. These outcomes are then discussed in terms of their likely contribution to accessibility and sports research, their limitations, and the implications for sports administration and talent identification.

2. Research Issues/Background

The professionalization of sports and desires for national performance in international competitions such as the Olympic games has led to an intense focus on sports talent identification. Voluntary and professional recruiters work for sports clubs to source junior talent. Sports administrators look for locations that are over-producing talent, to try to understand what factors aid their success.

However, research on sports and accessibility is extremely limited. Leonard (1993) Bale (2001) and Buraimo et al. (2007) focused attention on the location of sports stadia in terms of population or market catchments, using less empirical methods. Geographic Information Systems (GIS) studies on transport access to/from stadia includes research by Berry et al. (2007) and Burke & Evans (2009) on access to sports stadiums.

Accessibility and remoteness research has proliferated in the era of GIS and widely available spatial data (Geurs and Risema van Eck 2001; Horner 2004; Liu and Zhu 2004; Vandenbulcke, Steenberghen and Thomas 2009) (CITE SOMEONE LIKE KRIZEK). Much accessibility research has been focused on questions of access to goods and services, including access to key services by low-socio economic groups (Preston and Rajé 2007; Talen 2001; Tsou, Hung and Chang 2005).

When modern spatial analytical techniques have been applied to sport, there are some indications that spatial factors influence sports player production. Côté, Macdonald, Baker, and Abernethy (2006) showed that elite athletes are overrepresented in smaller cities with populations less than 500,000. This effect has been replicated in other research, notably research on Australian athletes (Abernethy and Farrow 2005). These birthplace effects may be due to 'differential opportunities' offered in larger and smaller cities and their impacts on the development of expertise and skill (MacDonald et al. 2009:85). A major criticism of these studies are that they are based on unverified birthplace records and tend to use an athlete's birthplace versus their junior training location (where their skill may have been developed).

¹ ARC Linkage Project LP 221008

This is especially problematic in Australia given this nation's high residential mobility. Further, there as yet has been no further interrogation into other spatial factors that might be influential in player development, or how transport accessibility and remoteness may be a key determinant of 'differential opportunities', or a superior explanation.

We contend that analysis of this nature should focus on a player's place of junior development. Conceptually, if one can geo-code that information for a large population of elite athletes, and match it with both socio-demographic data for the populations in those areas, and with measures of transport accessibility and remoteness, one should be able to identify any possible associations between the variables.

This approach is applied to data for players recruited to Australian Football League (AFL), the largest professional sports league in Australia. All players recruited from 1997-2010 who played at least one senior AFL game were exhaustively researched to identify their place of junior development, defined as the club or school where they were registered whilst playing during the ages of 11 to 15. This information was captured through national AFL Draft records, secondary sources and information provided by key informants. The AFL provided the authors with geo-spatial information from past AFL Censuses, allowing the data on players to be geo-coded and aggregated into defined AFL regions, and matched with junior participation and Australian Bureau of Statistics (ABS) census data. This approach we have labelled Talent Tracker, being a tool that identifies spatial variation in player talent production. The Talent Tracker results were then matched with Accessibility/Remoteness Index of Australia (ARIA) data, allowing for spatial regression.

Though previously untried, this is a logical, empirical approach that offers more robust input data and methods than most previous studies of sports talent development across cities and regions. However, this is only the early stages of the research effort. We are at first exploring bivariate associations, to ascertain whether transport access should be taken forward as a factor for future multivariate analysis, and as a factor warranting deeper examination in qualitative studies.

Our hypothesis is that, given the town size effects previously observed in birthplace studies, that transport accessibility and remoteness will be associated with AFL talent development across AFL regions.

3. Methods

3.1 Talent Tracker

The full *Talent Tracker* methods are provided in Woolcock and Burke (In Submission) and we provide only a summary here. They provide a significant advance on previous approaches to exploring and geo-coding regional performance in talent development.

In *Talent Tracker*, a region's efficiency in producing sports talent is considered not as a function of population (i.e. talent produced per young person resident in the area) but as a function of participation (talent produced per young person registered and playing in the area). On this basis, we created a measure of talent development for AFL players, based on available datasets, including the annual AFL census, provided by the AFL.

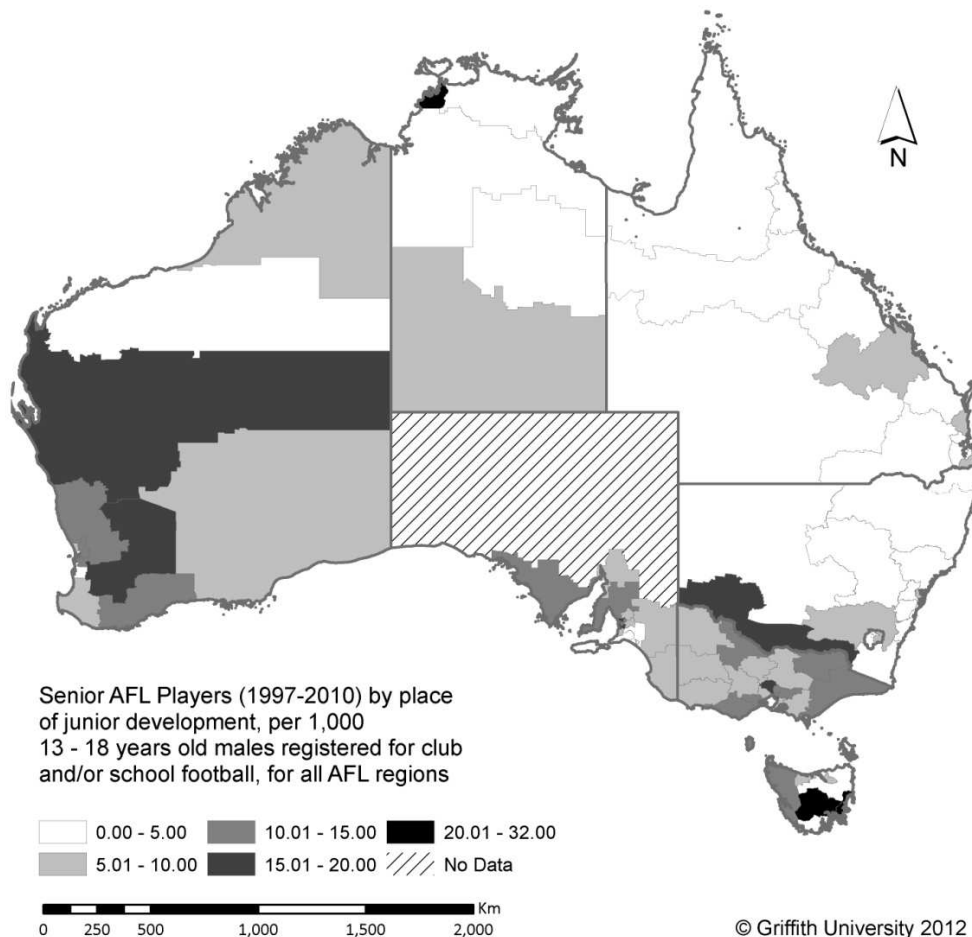
The principle performance measure is a region's 'talent yield' based on participation. Talent was defined as the number of AFL players who were either drafted through the main national draft or played at least one game of senior AFL football in the period 1997-2010 who developed in a specific region. The place of junior development was measured by the place (club or school) where they were registered as playing AFL from the age of late primary/early high school (11 to 15 years of age). Only one place of development was identified for each player. For those players who moved during their 11-15 ages, priority was given to the club or school where they spent most time during the period, with further priority given to the late primary years in cases where approximately equal time was spent in two regions.

Participation was defined as the number of 13-18 year old males registered for either club and/or school football in each AFL region.

Data on player place of junior development was sourced initially by provision from the AFL of national draft records, which from the year 2005 had comprehensively documented the key junior club or school location for players, as defined above. The set of players with missing records involved player-by-player tracking, with information provided by informants including AFL historians, state-based talent identification managers, and junior and feeder club officials, as well as secondary data sources. Preliminary lists of talent identifying place of junior development were twice distributed to state-based AFL officials for clarification and revision.

When completed, this dataset was aggregated to 94 identified 'AFL regions'; including 38 metropolitan and 56 country regions, as used in the annual AFL census. The AFL talent 'yield' was defined as the ratio of talent to participation in each of the regions, expressed as talent produced vs. average participation per year. A map showing the talent yield per AFL region is provided in Fig. 1.

Figure 1 AFL Talent Yield (1997-2010) by AFL Region



3.2 ARIA

Numerous studies have used Accessibility/Remoteness Index of Australia (ARIA) data, provided by the Commonwealth Department of Health and Ageing, to explore relationships with other geo-spatial datasets. This includes investigations into associations between various health issues and transport accessibility (Eckert, Taylor and Wilkinson 2004; Murray et al. 2004; Rajkumar and Hoolahan 2004) access to basic foods (Michelle S Harrison et al. 2007) and even attitudes towards sex in Australia and accessibility/remoteness (Rissel et al. 2003). These studies demonstrate viable means to match spatial data and apply basic statistical techniques to identify associations between variables.

ARIA uses measures of accessibility via road networks to services, to develop a standard classification and an index of accessibility/remoteness (Commonwealth Department of Health and Aged Care 2001:3).. Developed by the National Key Centre for Social Applications of Geographical Information Systems (GISCA), ARIA is ‘an unambiguously geographical approach to defining remoteness’, using only access via the road network to services, such that other socio-economic, rural/urban and town size effects are not incorporated in the measure (Commonwealth Department of Health and Aged Care 2001:3). ARIA measures only spatial or locational disadvantage, not socio-economic disadvantage.

ARIA uses distance measured from 11,340 localities to 201 service centres on available road networks, using GIS, with the result measured as a continuous variable (Commonwealth Department of Health and Aged Care 2001:3). Service centres are placed in four categories. Population size is used as a proxy for the services available in particular locations, a relationship that was tested and validated using other datasets. GIS is used to produce a continuous variable, calculated from the actual distance via the road network from 11,340 localities to 201 service centres. ARIA scores are relatively straightforward: localities that are more remote have decreased access to service centres. See the full report on the ARIA methodology (Commonwealth Department of Health and Aged Care 2001) for further information.

Conceptually, access to training, coaching and competition is likely to be influenced by access to centres of the type ARIA measures. In a small remote location a child may have access to a single playing field and a club and coach. But opportunities for higher-order skill training, junior development, junior competitions and other developmental supports are likely to occur in and around larger centres (though not necessarily just Australia’s largest metropolitan centres).

To better match the study period for AFL Players, (1997-2010) freely available ARIA data for 2001 Statistical Local Areas (SLAs) was obtained and then matched to the 94 AFL Regions, which were based on 2006 SLA regions. Each AFL region contained, on average, around ten SLAs. To produce a population-weighted index of the mean ARIA score for each AFL region the following procedures were applied. First, using *ArcInfo* GIS software, AFL region boundaries were snapped to the 2006 ABS census collection district (CCD) boundaries. The surface area of each 2006 SLA was then calculated and the 2001 and 2006 SLA regions intersected so as to attribute 2001 ARIA scores to all parts of the 2006 SLAs. Then, using a dissolve process, the 2006 SLA regions were ascribed their respective 2001 ARIA score. Population data from the ABS 2006 census was applied to all of the more disaggregate 2006 CCD regions. Knowing for each CCD it’s ARIA score, it’s population and the AFL region to which it belonged, we could calculate a population-weighted ARIA score for each AFL region. To do so, the following formula was applied:

$$PWIARIA_{AFLreg} = \frac{\sum_1^n (ARIA_{CCD_n} * Pop_{CCD_n})}{\sum_1^n Pop_{CCD_n}}$$

where:

$PWIA_{AFLreg}$ = Population Weighted Index of ARIA for an AFL region

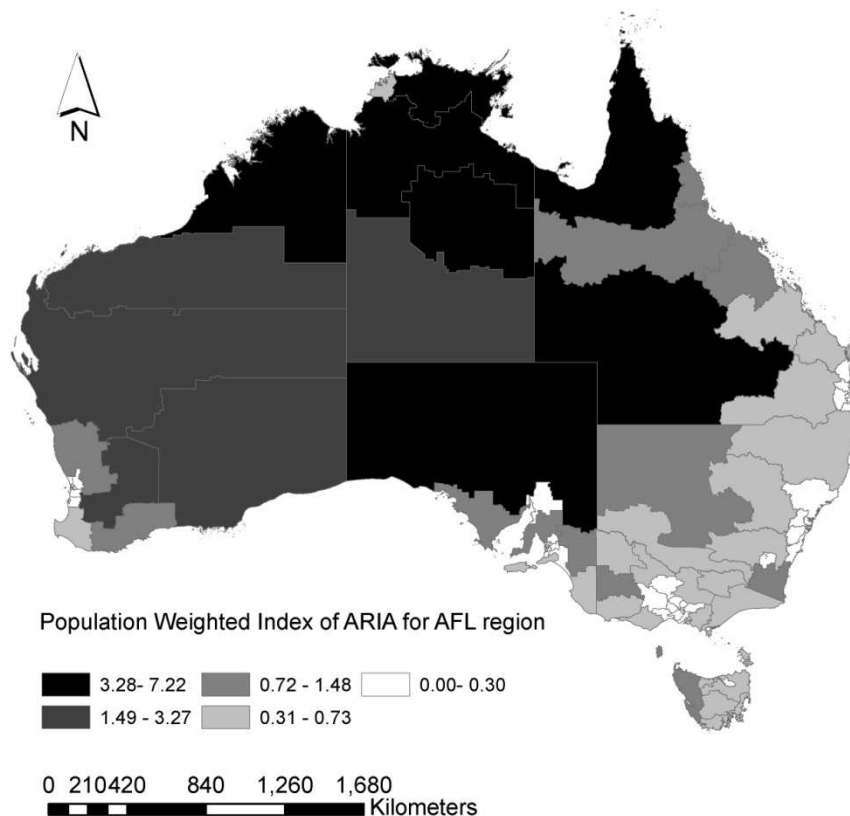
$ARIA_{CCD}$ = ARIA score for a CCD

POP_{CCD} = Usual Resident Population for a CCD

n = number of Collection Districts

A map showing the population-weighted index of ARIA scores for all AFL regions is provided in Figure 2.

Figure 2 Population-weighted index of ARIA scores by AFL region



There are some limitations to this approach. First, the various sources used to place AFL players introduces some potential for erroneous allocation of players to particular regions. There is also a small set of players who did not start playing Australian football until after the age of 15 that are omitted. Second, there are problems of areal aggregation in both the *Talent Tracker* and ARIA figures produced. More disaggregate ARIA data was available, but only at prohibitive cost well beyond the resources available to the authors. However, given the aggregation to AFL regions and the population-weighting methods applied, using more disaggregate data may not have reduced areal aggregation errors significantly. Thirdly, ARIA is a measure of road transport access only, and omits non-car transportation (albeit most buses use roads). The car dominates Australian travel behavior, especially leisure-related travel. But given boys aged 11-15 cannot drive legally and must rely on friends, family or public transport, there are limitations in how ARIA represents transport access to services, or in turn to training, coaching and competition.

3.3 Statistical analysis

Once derived, the population-weighted index of ARIA scores and the talent yield for all AFL regions were correlated using *SPSS* software using a standard bivariate Pearson correlation.

Summary statistics for the two variables are provided in Table 1.

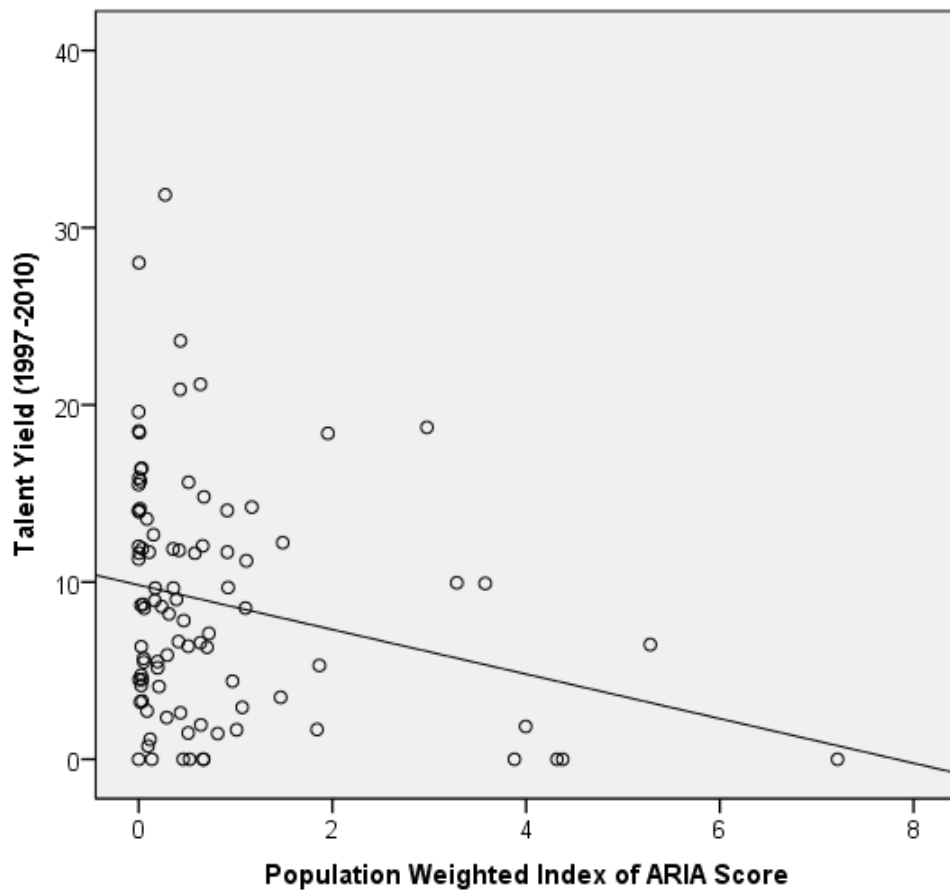
Table 1 Descriptive statistics for Talent Yield and PWIARIA for all 94 AFL regions

	N	Minimum	Maximum	Mean	Std. Deviation
Talent Yield (1997-2010)	94	0	31.85	8.84	6.72
Population Weighted Index of ARIA Score	94	0	7.22	0.79	1.30

4. Results

The scatterplot of the population-weighted index of ARIA scores and the talent yield for all AFL regions is provided in Figure 3.

Figure 3 Scatterplot: Talent Yield vs. Population Weighted Index of ARIA Score



The model results are provided in Table 2.

Table 2 Pearson Correlation results

		Talent Yield (1997-2010)	Population Weighted ARIA Score
Pearson Correlation	Talent Yield (1997-2010)	1.000	-.242
	Population Weighted ARIA Score	-.242	1.000
Sig. (1-tailed)	Talent Yield (1997-2010)	.	.009
	Population Weighted ARIA Score	.009	.
N	Talent Yield (1997-2010)	94	94
	Population Weighted ARIA Score	94	94

As expected, the Pearson correlation statistic of -0.242 suggests that as accessibility decreases and remoteness increases, talent yield decreases. The estimated size of the association is statistically significant ($p=0.009$, within the 1% confidence level) but the correlation coefficient is small. The hypothesis that transport accessibility and remoteness

affects sports talent development has support, but it appears transport's role may be limited, or moderated significantly by other factors. The results suggest it is mainly the more remote regions that particularly play a role, with the results strongly dependent on those regions with a population-weighted index of ARIA score of >1.5 .

Closer examination is revealing. Darwin, which has reasonably good transport accessibility to services, has one of the highest talent yields in Australia for AFL players. Yet Katherine and Barkly, the two regions immediately to Darwin's south and with very high indices for accessibility/remoteness, for the time period under review did not produce a single senior player in the national AFL competition.

However, there are numerous cases that deviate from the trend. Close inspection of the many AFL regions in highly accessible locations that are under-producing talent reveals that many of these are in the non-traditional AFL states in locations such as the Hunter, the Illawarra and Central Sydney. This suggests an under-performance due to non-spatial factors. There are also many regions that are significantly over-producing talent in quite remote locations, such as the Mid West Region and the Wheatbelt of Western Australia.

5. Discussion

The findings are in the direction predicted. As transport accessibility increases and remoteness decreases, a region is more likely to produce talented AFL players. But the strength of the association is limited. It is strong enough to suggest that transport access is an influence that should be considered alongside the town size effects noted in past studies (Abernethy and Farrow 2005; Côté, Ericsson and Law 2005; MacDonald et al. 2009). And it is sufficient to add further support to the notion that place is fundamental to the production of sports talent.

The contributions of this work include the *Talent Tracker* methods, that not only overcome the limitations of studies focused on birthplace effects, but also provide tables and mapping that allow comparison and ranking of regional performance at national and metropolitan scales. The work demonstrates the potential to explore the effects of transport accessibility and remoteness on aspects of society outside of health, which has been the focus of most of the work using the ARIA datasets.

The implications of the results are many. The AFL and other sports bodies are likely to have many problems producing talent from extremely remote locations in Australia. The much publicized recruitment of Melbourne Demons AFL star Liam Jurrah, an initiated Walpirri man from the remote indigenous communities of Central Australia, highlights common knowledge that there are talented athletes in these locations, but that there are significant difficulties in identifying and nurturing that talent. But there are many locations with quite significant transport access limitations that buck this trend.

The research raises questions about locations such as the Wheatbelt of Western Australia, as to what has allowed them to produce so many AFL players? Is there something about transport and the sports landscape at the regional scale that allows them to overcome these problems? Or are other non-spatial factors – such as the Western Australian Football League's considerable investment in regional and remote community development - working to overcome these limitations? The broader study of which this work is a part seeks to answer such questions. Other opportunities for further research include examining the combined effects of other spatial variables such as socio-economic status, town size and transport accessibility, together, to further refine and understand the relative influence of these factors and see whether transport has more of an impact, once these other factors are controlled for. The authors are currently working to advance that research agenda.

Acknowledgements

This work was initially funded by a small grant provided by the AFL and Griffith University, and later by an Australian Research Council – Linkage Project (LP 221008), supported by the Australian Sports Commission, the AFL, Cricket Australia and Tennis Australia. *Talent Tracker* would not have been possible without the support of the AFL and a number of key officers and informants, and we are particularly indebted to the many AFL historians, AFL officials and others who helped complete the database of players by place of junior production. Sincere thanks are given to our colleagues Dwight Zackus, Murray Bird, Kristine Toohey and other investigators on the ARC grant underpinning the work. Special thanks to Lavinia Poruschi, Maryam Shobeirinejad, Joshua Skinner and Emily Hatfield for their efforts in data collection, preparation and analysis. Thanks also to Terry Li, Siti Amri and Rick Evans for their technical GIS support.

References

- Abernethy, A.B. and D. Farrow. 2005. "Contextual factors influencing the development of expertise in Australian athletes." Presented at Promoting Health and Performance for Life; Proceedings of the ISSP 11th World Congress of Sport Psychology, 15-19 August, 2005, Sydney.
- Bale, J. 2001. *Sport, Space and the City*. Caldwell, N.J.: Blackburn Press.
- Berry, J., D. Carson, and M. Smyth. 2007. "A Multi-purpose Sports Stadium: in-town versus out of town location." Belfast: University of Ulster.
- Buraimo, B., D. Forrest, and R. Simmons. 2007. "Freedom of Entry, Market Size, and Competitive Outcome: Evidence from English Soccer." *Southern Economic Journal* 74(1):204-213.
- Burke, M. and R. Evans. 2009. "Public Transport Access to Proposed Stadium Sites." in *8th International Conference of Eastern Asia Society for Transportation Studies*. Surabaya, Indonesia: Eastern Asia Society for Transportation Studies.
- Commonwealth Department of Health and Aged Care. 2001. "Measuring Remoteness: Accessibility/Remoteness Index of Australia (ARIA) - revised edition." in *Occasional Papers: New Series Number 14*.
- Côté, J., K.A. Ericsson, and M.P. Law. 2005. "Tracing the Development of Athletes Using Retrospective Interview Methods: A Proposed Interview and Validation Procedure for Reported Information." *Journal of Applied Sport Psychology* 17(1):1-19.
- Côté, J., D.J. Macdonald, J. Baker, and B. Abernethy. 2006. "When 'where' is more important than 'when': Birthplace and birthdate effects on the achievement of sporting expertise." *Journal of Sports Sciences* 24(10):1065-1073.
- Eckert, K.A., A.W. Taylor, and D. Wilkinson. 2004. "Does health service utilisation vary by remoteness? South Australian population data and the Accessibility and Remoteness Index of Australia." *Australian and New Zealand Journal of Public Health* 28(5):426-432.
- Geurs, K. and Risema van Eck. 2001. *Accessibility Measures: review and applications*. Bilthoven, The Netherlands: Rijksinstituut voor Volksgezondheid en Milieu.
- Horner, M. 2004. "Exploring Metropolitan Accessibility and Urban Structure." *Urban Geography* 25(3):264-284.
- Leonard, W.M. 1993. *A Sociological Perspective of Sport*. New York: Macmillan.
- Liu, S. and X. Zhu. 2004. "Accessibility Analyst: an integrated GIS tool for accessibility analysis in urban transportation planning." *Environment and Planning B: Planning and Design* 31(1):105-124.
- MacDonald, D.J., M. Cheung, J. Côté, and B. Abernethy. 2009. "Place but not Date of Birth Influences the Development and Emergence of Athletic Talent in American Football." *Journal of Applied Sport Psychology* 21(1):80-90.
- Michelle S Harrison, Terry Coyne, Amanda J Lee, Dymrna Leonard, Simone Lawson, Anita Groos, and Bronwyn A Ashton. 2007. "The increasing cost of the basic foods required to promote health in Queensland." *Medical Journal of Australia* 186(1):9-14.

- Murray, G., F. Judd, H. Jackson, C. Fraser, A. Komiti, G. Hodgins, P. Pattison, J. Humphreys, and G. Robins. 2004. "Rurality and mental health: the role of accessibility." *Australian and New Zealand Journal of Psychiatry* 38(8):629-634.
- Preston, J. and F. Rajé. 2007. "Accessibility, mobility and transport-related social exclusion." *Journal of Transport Geography* 15(3):151-160.
- Rajkumar, S. and B. Hoolahan. 2004. "Remoteness and issues in mental health care: experience from rural Australia." *Epidemiology and Psychiatric Sciences* 13(02):78-82.
- Rissel, C.E., J. Richters, A.E. Grulich, R.O. de Visser, and A.M.A. Smith. 2003. "Sex in Australia: Attitudes towards sex in a representative sample of adults." *Australian and New Zealand Journal of Public Health* 27(2):118-123.
- Talen, E. 2001. "School, Community, and Spatial Equity: An Empirical Investigation of Access to Elementary Schools in West Virginia." *Annals of the Association of American Geographers* 91(3):465-486.
- Tsou, K.-W., Y.-T. Hung, and Y.-L. Chang. 2005. "An Accessibility-Based Integrated Measure of Relative Spatial Equity in Urban Public Facilities." *Cities* 22(6):424-435.
- Vandenbulcke, G., T. Steenberghen, and I. Thomas. 2009. "Mapping Accessibility in Belgium: a tool for land-use and transport planning?" *Journal of Transport Geography* 17(1):39-53.
- Woolcock, G. and M. Burke. In Submission. "Measuring spatial variations in sports talent development: the approach, methods and measures of Talent Tracker." Submission to *Australian Geographer* – not yet accepted for publication.