Journal of Medical Radiation Sciences

Open Access

ORIGINAL ARTICLE

‘Growing your own’ a case study of a collaborative training program in medical radiation science

Imo Inyang, PhD[1], Tony Barnett, PhD[1], Kehinde Obamiro, PhD[1], Merran Rogers, Grad Cert Uni L&T[2], Andrew Kilgour, PhD[3], & Denis Visentin, PhD[2]

[1]Centre for Rural Health, University of Tasmania, Tasmania, Australia
[2]School of Health Sciences, University of Tasmania, Tasmania, Australia
[3]Charles Sturt University, Wagga Wagga, NSW, Australia

Keywords
allied health training, medical radiation practitioner, Medical radiations, nuclear medicine technologists, radiation therapist, radiographers, rural health workforce

Correspondence
Andrew Kilgour, School of Health and Biomedical Sciences, RMIT University, Melbourne, Australia. E-mail: andrew.kilgour2@rmit.edu.au
Denis Visentin, School of Health Sciences, University of Tasmania, Tasmania, Australia. E-mail: denis.visentin@utas.edu.au

Received: 16 October 2022; Accepted: 14 June 2023

J Med Radiat Sci **70** (2023) 398–405

doi: 10.1002/jmrs.704

[Correction added on 22 July 2023, after first online publication: The affiliations for the authors - Kehinde Obamiro and Andrew Kilgour, and the Data Availability Statement have been amended in this proof].

Abstract

Introduction: Two universities run a collaborative Medical Radiation Science program where students undertake study in Tasmania before transferring to a partner university in another state to complete their program. This study assessed rates and predictors of graduate radiographers, radiation therapists and nuclear medicine technologists (collectively classified as medical radiation practitioners according to AHPRA [https://www.medicalradiationpracticeboard.gov.au/About.aspx; ahpra.gov.au/registration/registers] contemporary classification) returning to Tasmania and rural locations to practice. **Methods:** A cross-sectional 22-item online survey including open-ended questions was administered via Facebook. Rates of graduates working in Tasmania and rural locations, work satisfaction, and program efficacy were assessed. Logistic regression was used to assess predictors of working in Tasmania and rural locations. **Results:** 58 Facebook members from a total of 87 program graduates were invited to participate. Of these, 21 responded. Thirteen (62.0%) were currently working in Tasmania, of which the majority practised in regional (MMM2) areas. Most (90.5%) reported that they were happy at work, with all participants reporting the course prepared them well or very well for their first professional jobs. 71.4% stated that the provision of the first 2 years of the course in their home state influenced their decision to study medical radiation science. Being born in a rural region (MMM > 2) was a predictor for working in Tasmania (OR = 3.5) and rural locations (OR = 1.77). Males were twice as likely to work in Tasmania (OR = 2.3) and more rural locations (OR = 2.0). **Conclusions:** Collaboration is beneficial in producing professionals in regions with smaller enrolments limit the ability to grow their own graduates independently. Interuniversity collaborative models are recommended for other rural regions to meet local health workforce needs.

Introduction

The shortage and poor retention of allied health professionals in rural and remote Australia is of major concern, and has been found to have negative ramifications for healthcare services, with consequent adverse effects on patient outcomes.[3] Inequalities in the health status of rural and remote Australian residents compared to their metropolitan counterparts are well documented.[4,5]

In Australia, allied health professionals, of which Medical Radiation Practitioners are a part, account for about 18% of the healthcare workforce, with Medical Practitioners and Nurses contributing 12% and 63%, respectively.[6] Radiographers, radiation therapists, and nuclear medicine technologists are collectively classified as

medical radiation practitioners according to the AHPRA[1,2] contemporary classification. In 2019, there were 14,865 Medical Radiation Practitioners, representing 2.4% of the 625,228 total health workforce.[7] A 2019 National Health Workforce Dataset (NHWD)[7] found that of the 14,865 medical radiation practitioners in Australia, a great majority (11,708 or 79%) worked in metropolitan regions (MMM1), with the remainder (21%) practising in MMM2-MMM7 areas. In Tasmania, 313 Medical Radiation Practitioners served a population of 509,965 Tasmanians. This represents 2.2% of the Tasmanian health workforce and translates to approximately 59 practitioners per 100,000 population, or one qualified professional serving 1707 residents. This compares favourably with the national average of one Medical Radiation Practitioner per 1706 people.[7] Similar to other allied health professions, there is a greater number of females (9952 or 67%) than males (4913 or 33%) in practice.

While there is growing evidence regarding shortages of allied health professionals in rural and remote areas, the primary focus for rural and remote recruitment initiatives has been on the medical profession.[8] There is also a dearth of evidence regarding the success of measures evaluating the effectiveness of rural allied health recruitment and retention programs.[9]

In Australia, the Modified Monash Model (MMM) is a classification of rurality and ranges from MMM1-MMM7, where MMM1 refers to metropolitan areas, and MMM7 refers to very remote regions.[10] This model helps in understanding the health workforce distribution of health care workers. Because of its relatively small population compared to other States, there is no MMM1 (Metropolitan) region in Tasmania. Areas are classified from MMM2 (Regional centres) to MMM7 (Very remote communities).

On average, Tasmanian Medical Radiation Practitioners are older than their counterparts in other states and territories, with an average age of 41 years against the national average of 39 years.[11] This would suggest a need to attract younger professionals to the state as older workers prepare for retirement. The latest report (2019) by the Australian Government Department of Employment, Skills, Small and Family Business stated that the majority of employers experienced difficulties attracting suitable Medical Radiation Professionals to fill vacancies in Tasmania, with only 44% of advertised positions filled during the survey period. This survey also noted that Tasmania was perceived to offer limited opportunities for career development.[12]

Previous research[13] suggested that to assist in easing the shortage of allied health professionals in rural and remote areas, recent graduates with a rural background should be encouraged to take up employment in these areas, given their social identification and ties to these regions.

A recent Australian study assessing factors related to non-metropolitan primary place of practice (PPP) for Medical Radiation Science graduates found that location of origin, and type of Medical Radiation Science discipline were significant predictors of rural PPP after controlling for other variables. Graduates of rural origin were more likely to have a rural PPP (OR = 3.54) than those from metropolitan locations, with diagnostic radiography graduates more likely to have a rural PPP (OR = 5.46) than nuclear medicine graduates.[14]

The two Universities medical radiation science program

Tasmania is the only state in Australia which has not historically had a stand-alone full medical radiation course. As sole tertiary education provider in the state, the University of Tasmania (UTAS) has not developed a stand-alone medical radiation course as course viability due to the relatively low numbers of projected student enrolments would not be able to support the costs of running the course (facilities, equipment, and staffing). The Medical Radiation Science pathway program is a collaborative venture involving UTAS and Charles Sturt University (CSU). This pathway commenced in 2005.

Tasmania is a rural island state, with many of the health workforce challenges typical of other rural areas. As an island state, additional barriers to relocation exist, both for those seeking work and for students wishing to undertake study interstate in disciplines that are not available in Tasmania. The program sought to meet a number of needs, including unmet workforce needs in Tasmania for medical radiation scientists, and to provide opportunities for Tasmanian students to undertake a career in medical radiation science.

There was significant initial support from the Launceston General Hospital and private radiography providers in the North and North-West of the state. However, like many other tertiary institutions in regional areas, offering a full course was not feasible due to student demand and workforce needs not allowing the economies of scale required for a scientific course with significant laboratory, equipment, and staffing costs. Hence, a program where students were provided a clear and structured pathway to a mainland university, while having their initial study available in Tasmania, was devised.

UTAS had an existing 3-year Bachelor of Health Science degree which provided the opportunity for a pathway for students into the second year of the CSU program. The course aligned with many of the existing first year units in the CSU course, with units including Anatomy and Physiology and Pathology. The double degree program initially involved 4 years of study with

the first 2 years of study in Launceston, Tasmania, primarily in Health Science units, with four specialised Medical Radiation Science units including a clinical placement, and the final 2 years at CSU Wagga Wagga campus undertaking years 2 and 3 of the Bachelor of Medical Radiation Science, with full credit granted for Year 1 based on study at UTAS. Students can specialise in Diagnostic Radiography, Nuclear Medicine, or Radiation Therapy, although the majority of students in the program choose the Diagnostic Radiography stream.

Students graduate with both a Bachelor of Health Science from UTAS and a Bachelor of Medical Radiation Science from CSU under a cross-credit arrangement. Students undertake placements in public and private facilities, with many of these undertaken in Tasmania. The addition of UTAS students did not place an extra burden on clinical placements for the CSU program, as it opened up additional Tasmanian placements for the CSU course, with Tasmanian facilities welcoming home students on their Professional Experience Placement from CSU. CSU provided significant discipline support in the initial establishment of the course for Medical Radiation units to ensure alignment with CSU units. This ensured students were prepared and enabled for study on transfer.

Initially, the course had a small quota of 6 students per year, which was related to the availability of clinical placements. The course has since grown with a current quota of 20 across the three MRS specialisations.

Over the years, a number of other changes have taken place in terms of structure and content to ensure currency and ongoing alignment with the CSU course and professional accreditation requirements. The most significant were changing the program to a 5-year double degree (as the CSU program changed to a 4-year degree), the inclusion of Radiation Therapy and Nuclear Medicine specialisations in addition to the Diagnostic Radiography specialisation, and the availability of study on the CSU Port Macquarie Campus.

Students now study their first 2 years in Tasmania, 2 years at CSU, with their final year in a clinical residency, often undertaken in their home state of Tasmania. The I-Med network, which is a significant private provider of radiology services in Tasmania, offers several final year scholarships in Tasmania each year, encouraging these students to return to Tasmania, and hopefully gain employment upon graduation. There is also strong support from Launceston General Hospital, and the Royal Hobart Hospital, the only two public radiology departments in Tasmania.

The UTAS course has had significant input from both public and private providers. Several clinical staff have served as adjunct appointments and provided clinical teaching into the program. The Launceston General Hospital (LGH), in particular, has provided the use of their facilities for teaching, with other practices also providing clinical education and resources. The LGH also donated a decommissioned X-ray machine for teaching purposes. The course has been guided by a Course Advisory Committee, with members from the professions from around the state, and CSU staff.

To meet future workforce needs in the North-West of the state, the Elphinstone Family Scholarship was established, open to students from this region who were undertaking a Medical Radiation Science degree. The intent of the scholarship was that students would return to work in their regional area at the completion of their studies. This program benefitted many students from this area of the state, initially in diagnostic radiography, and later in radiation therapy.

Clearly there is a shortage of medical radiation practitioners in Tasmania, especially in rural and remote regions of the state, but the extent to which graduates of the UTAS medical radiation science program contribute to the state's workforce and underpinning factors is poorly understood, warranting investigation. A recent study on social determinants of rural health workforce retention[15] found that rural familiarity is one of the factors worth exploring.

Whilst the shortage of Medical Radiation Practitioners in Australia is a national issue, there are limitations on the information available regarding the shortages on a state-by-state basis. The aim of this study was therefore to assess how successful the combined course has been in terms of meeting regional/rural needs for the medical radiation practitioner workforce in Tasmania and also to investigate the predictors of medical radiation science graduates from the UTAS/CSU collaboration returning to Tasmania to work in this profession.

Methods

Setting and population

A cross-sectional survey was open to all medical radiation science graduates of the UTAS/CSU collaboration ($N = 75$) since its inception in 2005–2019, and Ethics approval to conduct survey was sought and granted by the Tasmanian Health and Medical Research Ethics Committee (Ethics Project ID: 20232).

Recruitment of participants

Invitation was extended to graduates of the Bachelor of Health Science/Medical Radiation Science (BHlthSc/MedRadSC) offered through the UTAS/CSU collaboration since 2005. Recruitment was through Facebook, with the

site maintained by the UTAS course coordinator (one of the study authors). The contact details of graduates were not known to the researchers. In this study, participants were widely dispersed locally, interstate, or internationally based. They were recruited via a Facebook subscription at the height of the COVID-19 pandemic. This was a form of convenient sampling open to all subscribers to the study's Facebook account. To encourage participation, other graduates were recruited via a Snowball technique. None of the investigators had knowledge or details of who took part in the study.

Survey

A cross sectional survey using a four page, 22-item online questionnaire (with closed and open-ended questions) was developed in consultation with all authors. The questionnaire was divided into four sections. The first section asked about demographic information including age, gender, aboriginality status, town participant was born in, and town participant grew up in. Section two was devoted to education and training, including experiences working in a rural area, while section three explored participants' work experiences, general attitude towards work, and how preparation provided in the course equipped them for professional employment. A fourth section extended an invitation to willing participants to undertake a follow-up Skype or telephone interview to further share their experiences during and after the course.

The questionnaire was administered via a tested and proven valid instrument for health studies recruitment-Facebook.[16] This was chosen for its advantages over traditional recruitment methods that rely on flyers, newspaper advertisements, radio and television broadcasts, letters, e-mails, website listings, and word of mouth.[17,18] The Facebook account was maintained by one of the study authors. Additional data for graduates from the program was obtained from available data from UTAS student management systems. Data collection period was between July 2020 and June 2021.

Statistical analysis

Characteristics of participants were assessed using descriptive statistics. Univariate logistic regression analysis was used to determine odds ratios (OR) for possible predictors of working in Tasmania and rural areas upon graduation from the course.

The statistical package used for all analyses was Stata version 17.0 available from StataCorp, College Station, TX 77845, USA.

Results

At the time of reporting, there had been a total of 87 graduates from the UTAS/CSU program. Graduates from the course were all Tasmanian residents when they entered the course. Of these graduates, more than half (n = 48, 55.2%) were from the two regional centres of Hobart and Launceston, with 16 (18.4%) from large rural towns, 3 (3.4%) from medium rural towns and 20 (23.0%) from small rural towns. No graduates were from remote or very remote communities in Tasmania.

The 58 graduates who subscribed to the program's Facebook account were invited to participate in this study. Of these, 21 took part, representing a response rate from the initial approach of approximately 36%. The overall mean age was 26.95 (SD = 3.4) years with a range from 23 to 33 years. There were 8 (38%) males and 13 (62%) females. Male participants were slightly older (Mean = 27.6, SD = 3.46) than females (Mean = 26.5 SD = 3.43). Two thirds (n = 14) of respondents were under the age of thirty (Table 1). Although the specialisation was not assessed, the majority of graduates from the program are Diagnostic Radiographers.

All but one participant had undertaken a rural placement during the course, but all participants were still registered and practising medical radiation science during the study period (Table 2). No participants were of non-Aboriginal or Torres Strait Islander (ATSI) background. All participants were born and grew up in Tasmanian locations, and hence none were born or grew up in Metropolitan Centres. Regarding rurality, the study participants were representative of graduates overall. More than half were born and grew up in the regional

Table 1. Participant characteristics.

Characteristic	Level	Mean (SD) or *N* (%)
Age (years)		27.0 (3.4)
Gender	Females	13 (61.9%)
	Males	8 (38.1%)
Aboriginal or Torres Strait Islander	No	21 (100.0%)
Town Born	Regional Centres (MMM2)	12 (57.1%)
	Large Rural Towns (MMM3)	7 (33.3%)
	Small Rural Towns (MMM5)	2(9.5%)
Town grew up	Regional Centres (MMM2)	12 (57.1%)
	Large Rural Towns (MMM3)	8 (38.1%)
	Small Rural Towns (MMM5)	1 (4.8%)

Table 2. Work-related characteristics.

Characteristic	Level	*N* (%)	
Had rural placement as a student	Yes	20 (95.2%)	
	No	1 (4.8%)	
Characteristic	Level	In Tasmania	Total
Still registered and practising	Yes	13 (61.9)	21 (100.0%)
First professional job location	Metropolitan Areas (MMM1)	NA	3 (15.0%)
	Regional Centres (MMM2)	9 (69.0%)	12 (60.0%)
	Large Rural Towns (MMM3)	4 (31.0%)	5 (25%)
Current professional job location	Metropolitan Areas (MMM1)	NA	5 (23.8%)
	Regional Centres (MMM2)	9 (69.0%)	12 (57.1%)
	Large Rural Towns (MMM3)	4 (31.0%)	4 (19.1%)

centres of Launceston and Hobart (57.1%), with a third (33.3%) born in large rural towns and 2 born in small rural towns (9.5%) (Table 1).

Of the 21 graduates who participated in the study, 13 (62%) were currently working in Tasmania, with the same number having their first job in Tasmania. Two participants had their first job in Tasmania but now worked interstate, and correspondingly two who had their first employment on the mainland had returned to currently work in Tasmania. A majority of those who currently worked in Tasmania ($n = 9$) or (69.2%) practised in MMM2 regions of the state-almost a split equally between Hobart and Launceston. The rest worked in MMM3; no participant worked in MMM4-7 locations. The same results were obtained for their first working location. Almost two thirds of participants 71.4% ($n = 15$) had worked in a rural area at some point in their careers (Table 2).

Most participants (90.5%) reported being happy at work, with only two participants (9.5%) expressing dissatisfaction. Correspondingly, almost three-quarters *disagreed* (33.3%) or *strongly disagreed* (38.1%) that they had thought about leaving their current job, while only two (9.5%) *agreed* that they had considered leaving. All respondents *agreed* (19.0%) or *strongly agreed* (81.0%) that they were satisfied with the quality of the course. All participants reported that the course had prepared them *well* (28.6%) or *very well* (71.4%) for their first professional job. Almost 3 quarters (71.4%) *agreed* or *strongly agreed* that the provision of the course by UTAS influenced their decision to study medical radiation science (Table 3).

Logistic regression was performed for those working in Tasmania, and those working in more rural areas (MMM >2) compared to those working in regional centres (MMM2). This distinction was chosen since all areas of the state of Tasmania are classified regional (MMM2), rural (MM 3, 4, 5), or remote (MM 6, 7), and this allows separation of rural categories in the Tasmanian context. There were no significant associations observed due in part to the small sample size, although large effect sizes were evident. Males were twice as likely

Table 3. Participant satisfaction with work and course.

	Response rate *N* (%)				
Question	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Satisfied with quality of course	–	–	–	4 (19.0%)	17 (81.0%)
Provision of course on choice of medical radiation science	2 (9.5%)	–	4 (19.0%)	9 (42.9%)	6 (28.6)
Are you happy at work?	1 (4.8%)	1 (4.8%)		15 (71.4%)	4 (19.0%)
Thought about leaving your job	8 (38.1%)	7 (33.3%)	4 (19.0%)	2 (9.5%)	
	Not at all	Not well	Do not know/unsure	Well	Very well
Course preparation for first job	–	–	–	6 (28.6%)	15 (71.4%)

Table 4. Association between demographics with working in Tasmania and working in more rural location (MMM > 2).

		Working in Tasmania				Work in MMM > 2			
Parameter	Level	OR	SE	95% CI	*P*	OR	SE	95% CI	*P*
Age	Per year	1.01	0.137	[0.775, 1.32]	0.933	1.24	0.225	[0.973, 1.78]	0.226
Gender	Female (*n* = 13)	Reference Category		–	–				
	Male (*n* = 8)	2.25	2.09	[0.365, 13.9]	0.382	2.00	1.97	[0.291, 13.7]	0.481
Town grew up	MMM = 2 (*n* = 12)	Reference Category							
	MMM >2 (*n* = 9)	3.50	3.46	[0.505, 24.3]	0.205	1.75	1.77	[0.242, 12.6]	0.579

95% CI, 95% Confidence Interval; MMM, Modified Monash model for location. In Australia, MMM1 is a major city, MMM7 is a very remote area; OR, Odds Ratio; *P*, Probability Value for Regression; SE, Standard Error.

as females to be working in Tasmania (OR = 2.3) and working in more rural location (OR = 2.0). Those who were born in a more rural region (MMM >2) were more likely to be working in Tasmania (OR = 3.5) and more likely to work in more rural locations (OR = 1.77; Table 4). Age did not affect working in a rural area nor returning to work in Tasmania (Table 4).

According to the National Health WorkforceDataset,[19] in 2019, a great majority of Tasmanian Medical Radiation Practitioners worked in the regional centres of Hobart and Launceston. Of these, 97 (31%) were male and 216 (69%) were female. There were no practitioners in remote and very remote communities, and only 3 (0.96%) worked in MMM5, all of whom were female. In our study, 8 (38%) were males 13 (62%) were females. The average age of Tasmanian Practitioners was 41 years compared to 27.0 years for this study, which reflects that the graduates from the program are in their early careers with the first cohort graduating in 2008.

Discussion

Given that there is a shortage of medical radiation practitioners in Tasmania, this study considered to what extent this collaborative course model has assisted in producing graduates who are returning to work in Tasmania. This may inform practices and opportunities at other rural locations which have similar workforce issues. Such knowledge is needed to help shed light on possible determinants and predictors of shortages of Medical Radiation Practitioners in Tasmania. Common reasons for health workforce distribution have been widely studied, but mostly among medical practitioners and nurses. There have been no previous surveys investigating job destinations of Tasmanian medical radiation science graduates. Although based on a modest sample, our study found that UTAS medical radiation science graduates are contributing to the health workforce of Tasmania, with almost two-thirds of the study participants returning from the mainland following graduation and currently working in the state. While the graduates of the program have been in all three MRP specialisations, the majority of graduates (and hence study participants) are radiographers.

In terms of the distribution of all UTAS Medical Radiation Science graduates by rurality, they are more rural than the Tasmanian population in general where 63% live in regional centres and only 18% in small rural[20] towns. This is despite the course being offered on campus in only one regional centre, Launceston, requiring other students to travel or relocate for study. More rural students had higher odds of both returning to work in Tasmania and working in more rural locations. One issue in attracting and retaining staff in Tasmania is that most Australian graduates are from or have studied in metropolitan centres and may be less likely to relocate to and stay in more rural locations.[21]

While the student intake of the UTAS/CSU program is small, the quota has grown from 3 students to 20 students per year since the program was first developed. While the total number of Tasmanian origin graduates is fewer than other institutions, the number per year is increasing and has the capacity to provide ongoing medical radiation professionals to augment the modest Tasmanian workforce requirements. This slow growth in student numbers has allowed relationships to be developed between UTAS, CSU, and public and private facilities. Any course with a clinical placement component is dependent on the availability of clinical placements, where there is competition for placements from other universities, with a significant strength of the UTAS course being use of clinical teaching spaces and involvement of clinical staff. The availability of placements and other uses of facilities in Tasmania has been driven by goodwill for a Tasmanian-based course, but also the potential for providers to have access to potential staff likely to want to live and work in Tasmania. While the program has primarily trained

radiographers, the growth of the course has also allowed the introduction of Nuclear Medicine and Radiation Therapy streams, allowing students more career choice, while requiring the development of new relationships with these providers in Tasmania.

Whilst the authors have no intention of influencing policy or changing the UTAS/CSU model, the recent change in the course to allow acceptance of mainland students to the course may hold promise as a conduit for recruiting and retaining these future medical radiation science graduates in the state. An Australian study concluded that there is merit in opening up university campuses in non-metropolitan areas, as it has the potential to influence practise in these areas.[22] Additionally, it has been found that allied health students who had a positive rural experience were more likely to want to practise in a rural setting.[23,24] The fact that mainland students would need to relocate to Tasmania for the first 2 years of their program may limit the attractiveness of this option, but for those students who do relocate, doing so would allow them to experience Tasmania and make connections, hence influencing their choice of Tasmania as a work location after graduating.

The context of this study was in Tasmania which is a rural location with a modest population of around half a million people. Despite the presence of a home university, the ability to run a standalone course in medical radiation science and other similar areas of workforce need is limited by these demographics. This study has provided evidence that the interuniversity collaboration has produced positive results to the benefit of society in the context of the medical radiation science profession, and also of the non-viability of a standalone course in Tasmania. This model may be considered to support other workforce needs in Tasmania, and in other contexts where a home tertiary institution lacks the resources to develop and deliver full courses where student intake is likely to be small. A great majority of participants had worked, and some are still working, in rural regions, thus contributing significantly to creating a supply of graduates to service areas of known workforce shortages.

This is the first study to investigate the destinations of UTAS medical radiation science graduates, and importantly, their contributions to the Tasmanian health workforce. Our study has some limitations. The course was designed to accommodate only Tasmanian students in an effort to address the obvious shortage of medical radiation practitioners in this state, and this may explain the low numbers of our potential participants. Additionally, participants were recruited through a Facebook account at the height of the COVID-19 global pandemic in 2020, when most people were more concerned about the future and the long-term effects of the pandemic. Two recent studies from the United Kingdom and Ghana found that medical radiation practitioners experience intense pressures and stress due to altered work patterns during a pandemic.[25,26] Both studies were of reasonable sample sizes (79% and 57% respectively), and therefore sufficiently empowered to tease out subtle effects. It is unclear if the timing and the recruitment strategy contributed to our limited sample size. Our study did not assess which Medical Radiation Science stream students had undertaken, so it was not possible to distinguish between the outcomes separately by stream. Future research could consider the perspective from public and private practices and departments in Tasmania regarding workforce requirements and the contribution to this being met by graduates from the collaborative program.

In conclusion, knowledge of the existing medical radiation practitioner workforce is crucial for workforce planning. This investigation was motivated by a lack of information on the UTAS/CSU medical radiation science graduate destinations. This study found that the UTAS/CSU collaboration is a proven model for improving access to medical radiation services in Tasmania, and it is recommended to other clinical disciplines experiencing workforce shortages but eager to grow their own in the face of limited resources.

The results of this study indicate that the UTAS/CSU model has been successful in addressing workforce needs and providing a pathway to practice for young Tasmanians from many regions, including rural areas. The authors would suggest the adoption of pathway partnerships by others where there are rural workforce shortages and small potential student cohorts. With an anticipated future ageing population and undersupply of medical radiation practitioners in Tasmania, efforts to improve training must focus on work ready graduates to address shortage of these professionals. The medical radiation course has proven to be very successful in attracting high-quality candidates drawn mostly from the north of the state, with growth of enrolments in southern part of the state (Hobart and surrounds) warranted to recruit and prepare southern based potential candidates for work in this important profession.

Conflict of Interest

The authors declare no conflict of interests.

Acknowledgements

This work was supported by the University of Tasmania Centre for Rural Health. The authors thank Mr Darren Grattidge for help with data extraction. We also

acknowledge the contributions of the survey respondents. Ethics approval to conduct survey was sought and granted by the Tasmanian Health and Medical Research Ethics Committee (Ethics Project ID: 20232).

Data Availability Statement

Data available on request from the authors.

References

1. AHPRA. 2022. Available from: https://www.medicalradiationpracticeboard.gov.au/About.aspx. (Accessed 24 January 2023).
2. AHPRA. 2023. Available from: ahpra.gov.au/registration/registers; ahpra.gov.au. (Accessed 24 January 2023).
3. Buykx P, Humphreys J, Wakerman J, Pashen D. Systematic review of effective retention incentives for health workers in rural and remote areas: towards evidence-based policy. *Aust J Rural Health* 2010; **18**: 102–9.
4. Dixon J, Welch N. Researching the rural-metropolitan health differential using the 'social determinants of health'. *Aust J Rural Health* 2000; **8**: 254–60.
5. Wakerman J, Humphreys JS. Rural health: why it matters. *Med J Aust* 2002; **176**: 457–8.
6. Keane S, Smith TN, Lincoln M, Wagner SR, Lowe SE. The rural allied health workforce study (RAHWS): background, rationale and questionnaire development. *Rural Remote Health* 2008; **8**: 1132.
7. Health Do. Dasboard, Summary Statistics- State. 2021 Available from: https://hwd.health.gov.au/resources/dashboards/nhwds-summary-state.html. (Accessed 22 July 2021).
8. Spiers MC, Harris M. Challenges to student transition in allied health undergraduate education in the Australian rural and remote context: a synthesis of barriers and enablers. *Rural Remote Health* 2015; **15**: 3069.
9. Dolea C, Stormont L, Braichet JM. Evaluated strategies to increase attraction and retention of health workers in remote and rural areas. *Bull World Health Organ* 2010; **88**: 379–85.
10. Health AGDo. Modified Monash Model. 2021 Available from: https://www.health.gov.au/health-topics/health-workforce/health-workforce-classifications/modified-monash-model. (Accessed 09 November 2021).
11. Health Do. Health Workforce Data. 2019 Available from: https://hwd.health.gov.au/. (Accessed 15 July 2021).
12. Department of Employment S, Small and Family Business. Medical Diagnostic Radiographer ANZSCO 2512–11. 2019 Available from: https://docs.employment.gov.au/system/files/doc/other/251211medicaldiagnosticradiographertas_2.pdf. (Accessed 23 April 2021).
13. Smith T, Cooper R, Brown L, Hemmings R, Greaves J. Profile of the rural allied health workforce in northern New South Wales and comparison with previous studies. *Aust J Rural Health* 2008; **16**: 156–63.
14. Farrugia L, Smith T, Depczynski J. Factors influencing medical radiation science graduates' early career principal place of practice: a retrospective cohort study. *J Med Radiat Sci* 2022; **69**: 182–90.
15. Cosgrave C, Malatzky C, Gillespie J. Social determinants of rural health workforce retention: a scoping review. *Int J Environ Res Public Health* 2019; **16**: 314.
16. Whitaker C, Stevelink S, Fear N. The Use of Facebook in Recruiting Participants for Health Research Purposes: A Systematic Review. *J Med Internet Res* 2017; **19**: e290.
17. Frandsen M, Walters J, Ferguson SG. Exploring the viability of using online social media advertising as a recruitment method for smoking cessation clinical trials. *Nicotine Tob Res* 2013; **16**: 247–51.
18. Tate DF, LaRose JG, Griffin LP, et al. Recruitment of young adults into a randomized controlled trial of weight gain prevention: message development, methods, and cost. *Trials* 2014; **15**: 326.
19. Dataset NHW. National Health Workforce. 2019 Available from: https://hwd.health.gov.au/resources/information/nhwds.html. (Accessed 11 July 2022).
20. Versace VL, Skinner TC, Bourke L, Harvey P, Barnett T. National analysis of the Modified Monash Model, population distribution and a socio-economic index to inform rural health workforce planning. *Aust J Rural Health* 2021; **29**: 801–10.
21. Miles R, Marshall C, Rolfe J, Noonan S. The attraction and retention of professionals to regional areas. *Australas J Reg Stud* 2004; **12**: 129–52.
22. Simpson MD, Wilkinson JM. The first graduate cohort at charles sturt university: what impact on the rural pharmacist shortage? *J Pharm Pract Res* 2002; **32**: 69–71.
23. Charles G, Bainbridge L, Copeman-Stewart K, Kassam R, Tiffin S. Impact of an interprofessional rural health care practice education experience on students and communities. *J Allied Health* 2008; **37**: 127–31.
24. Dalton LM, Routley GK, Peek KJ. Rural placements in Tasmania: do experiential placements and background influence undergraduate health science student's attitudes toward rural practice? *Rural Remote Health* 2008; **8**: 962.
25. Akudjedu TN, Botwe BO, Wuni AR, Mishio NA. Impact of the COVID-19 pandemic on clinical radiography practice in low resource settings: The Ghanaian radiographers' perspective. *Radiography (Lond)* 2021; **27**: 443–52.
26. Akudjedu TN, Lawal O, Sharma M, et al. Impact of the COVID-19 pandemic on radiography practice: findings from a UK radiography workforce survey. *BJR Open* 2020; **2**: 20200023.