Assessment of diabetes and cardiovascular disease in visitors to rural field day events

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Two organisations working together to reduce regional health inequality

The Royal Flying Doctor Service (RFDS) of Australia is one of the largest and most comprehensive aeromedical organisations in the world. Using the latest in aviation, medical and communications technology, RFDS provides extensive primary health care and 24-hour emergency service throughout Australia. RFDS Victoria is committed to the goal of all Victorians having access to healthy lifestyle information to enable wider choice and greater responsibility for their own wellbeing. Each year RFDS Victoria have a presence at various field days and farming and agricultural events to promote their organisation and services and build community engagement.

Baker IDI Heart and Diabetes Institute (Baker IDI) is an independent, internationally renowned medical research facility that extends from pre-clinical laboratory to wide-scale community studies with a focus on diagnosis, prevention and treatment of diabetes and cardiovascular disease (CVD). The Preventative Health group at Baker IDI invests heavily in community-based programs that seek to understand the evolving epidemic of diabetes and heart disease and respond accordingly to improve health outcomes - particularly in vulnerable individuals and communities.

In recent years, the RFDS Victoria, in partnership with the Baker IDI Preventative Health team, have provided free outreach health promotion and screening for diabetes and heart disease risk factors for a number of regional and rural Victorian communities.

Background

Individuals living in regional, rural or remote locations consistently fare worse in health than their metropolitan counterparts[1-3] with mortality rates rising with greater remoteness[4]. Regional Australians are more likely to die from coronary artery disease (44%) or stroke (31%) than those living in major cities[5]. Furthermore, regional Australians have been found to have high levels of antecedent risk for heart disease and other forms of CVD. Despite this, specialist cardiac services are scarce, few cardiologists practice in non-metropolitan areas[5] and there are less general practitioners (GPs)[6] per population.

Consistent with these data, three recent national studies published by Baker IDI including the *National Blood Pressure Screening Day*[3] and both the *Cholesterol Crossroads*[7] and *Pressure Points*[8] reports in primary care have unequivocally showed clear gradients of greater risk in regional *versus* metropolitan dwelling adults. Closer to home, the Baker IDI *Healthy Hearts Beyond City Limits*[9] program have also found high levels of risk and a need for more pro-active prevention in four regional Victorian communities.

Diabetes

Approximately 1 million Australians are diagnosed with diabetes including an estimated 130,000 people with type 1 diabetes[10]. Diabetes is often under-diagnosed and many are on the cusp of diabetes or unaware that they have it. The burden of diabetes is expected to increase in the future due to obesity especially around the waistline and Australians becoming more sedentary.

Diabetes is a complex disorder of carbohydrate metabolism caused by a combination of hereditary and environmental factors. It is characterised by insufficient production of, or reduced sensitivity to insulin, resulting in an imbalance of glucose homeostasis (excess sugar) in the blood stream. Diabetes Australia estimates that up to 60% of type 2 diabetes (majority of all cases) can be prevented in the high-risk (pre-diabetes) population by following a healthy diet and lifestyle plan. A screening blood test is an essential part of the prevention of diabetes. Glycated haemoglobin (HbA_{1c} or A1c), is a test that estimates the average blood sugar levels over a period of 3 months. It is utilised to assess an individual's longer-term blood glucose control and/or for diagnosis and classification of diabetes[11]

Cardiovascular disease

Diabetes is a key risk factor for CVD. CVD is the leading cause of death in Australia, being responsible for around 50,000 deaths per year[14]. The main types of CVD are coronary artery disease, stroke and heart failure/cardiomyopathy, but less common forms include rheumatic disease and congenital heart disease. CVD is often caused by a build up of fatty deposits (atherosclerotic plaques) in the arteries, narrowing it and restricting blood flow, potentially causing a heart attack, stroke or peripheral vascular disease. Risk factors that can increase an individual's chances of developing CVD include:

- diabetes
- family history of heart disease/stroke
- excess weight
- high blood pressure
- high blood cholesterol
- physical inactivity
- unhealthy eating
- smoking
- increased age
- kidney disease
- male gender
- high resting heart rate
- depression and stress.

Many of these risk factors can be reduced or modified by adopting a healthy lifestyle but may require medication.

Risk factors for diabetes and CVD

Blood pressure

High blood pressure (or hypertension) is a major risk factor for the development of diabetes complications including CVD, kidney disease and diabetic eye disease[1]. In 2003, hypertension contributed to around 8% of Australia's total disease burden[14]. Despite this, a significant portion of Australians who are being treated for hypertension do not meet national blood pressure targets. This puts them at an increased risk for premature CVD. Many hypertensive individuals have at least one modifiable CVD risk factor. Reducing one or more of these risk factors could potentially slow down disease progression and lessen future disease burden. Lifestyle changes including smoking cessation, regular physical activity, reduced body weight and restricted alcohol and salt intake are all beneficial to prevent hypertension.

Body fatness

Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify normal weight, overweight and obesity. It is calculated from height and weight measurements, using the formula body weight (kg) divided by the square of height (m). There are limitations to using BMI to assess if a person is in a healthy weight range as it does not distinguish between excess fat, muscle, or bone mass, nor does it provide any indication of the distribution of fat. Moreover, increased waist circumference is also associated with an increased risk of metabolic complications associated with obesity.

The RFDS Victoria Outreach Health Assessment Program

Prevention of diabetes and premature CVD can be accomplished through healthy dietary and lifestyle changes. It is especially important for people who are at increased risk of developing diabetes to make diabetes prevention a priority. It is equally important for healthcare providers/researchers to

identify individuals and communities that are most vulnerable and more susceptible to developing diabetes.

The key objectives of the RFDS Outreach Health Assessment Program was to provide free diabetes and cardiovascular health checks and to detect pre-diabetes and identify risk factors that otherwise might not have been detected. Applying appropriate early intervention would reduce the burden of heart disease in the community and potentially save lives. Early detection and proactive preventative measures to manage these risk factors would also help reduce healthcare costs.

Methodology

The Baker IDI Preventative Health team developed a health screening protocol and provided training for volunteer medical students and relevant personnel to undertake a basic health assessment at various field events organised by the RFDS Victoria. Attendees to these regional events were given a basic health screening and provided with a customised written report, accompanied with tips to improve or maintain good health. Follow-up telephone calls were made one month post-assessment. All study data were independently reviewed by the Baker IDI Preventative Health research team.

Event locations

Mallee Machinery Field Days

The Mallee Machinery Field Days attracts approximately 350 exhibitors and 8,500 public attendees every year to its Speed venue, approximately 400 km North West of Melbourne.

Date: 31 July to 1 August 2013
Location: Speed, Victoria
Number of health checks conducted:140

Sheepvention

Sheepvention is Hamilton Pastoral and Agricultural Society's biggest farming event that attracts over 25,000 regional Victorian visitors each year. Hamilton is a city in Western Victoria about 300 km from Melbourne.

Date: 5 to 6 August 2013
Location: Hamilton, Victoria
Number of health checks conducted: 168

Farm World

Farm World at Lardner Park, Warragul is Victoria's largest regional agricultural event, attracting more the 650 exhibitors and 50,000 people over four days. Warragul is about 100 km East-Southeast of Melbourne.

Date: 27 to 30 March 2014
Location: Warragul, Victoria
Number of health checks conducted: 359

Health assessment and data collection

Individuals who approached the RFDS Victoria marquee at each field event and showed an interest in having their risk factors assessed were provided with an information flyer and received an explanation of what assessments were being conducted. Four stations were setup with pre-trained staff to undertake a brief diabetes and CVD risk assessment.

Station 1 - registration and anthropometric measurements

The health screening process was explained to the participants and any questions they might have were answered at the beginning of each session. Each participant was provided with a study recording sheet to record date of birth, gender and postcode. Anthropometric data including height and weight (for estimation of body mass index [BMI]) and waist circumference were also measured at this station. The participants carried this record sheet with them as they progressed through each station.

Station 2 - blood pressure

Participants sat on a chair and took a few moments to rest before having their blood pressure taken with an automated blood pressure machine. A second reading was recorded after an interval of at least one minute. Both readings and pulse rate were entered on the participants recording sheet.

Station 3 - HbA_{1c} and AUSDRISK

A small finger-prick blood sample was taken at this station to measure HbA_{1c} using a fully automated point-of-care Afinion HbA_{1c} analyser

Once the blood sample was obtained, participants completed a computerised version of the Australian Type 2 Diabetes Risk (AUSDRISK) [18] assessment questionnaire (see **Figure 4**). The Baker IDI AUSDRISK assessment tool provides a simple, non-invasive method to identify Australian adults at high risk of developing type 2 diabetes who might benefit from interventions to prevent or delay its onset. This tool has been developed as a quick 'tick test' and converted into an electronic version for the RFDS health checks.

Station 4 - results and advice

Results were entered into a computer and a customised risk evaluation report was printed and given to the participant. The report provided a brief comment about each risk factor assessed and the screening staff at this final station also discussed the results and provided feedback to participants, including the need to seek further follow up from a health practitioner.

Post-event follow-up

Participants were given the option to provide their contact details to be followed up to evaluate the potential impact of the screening program. Follow-up telephone contact (at 1 month post-assessment) was made by a Baker IDI cardiac nurse to all attendees who provided contact details to follow-up the outcome of the advice they received at the risk assessment.

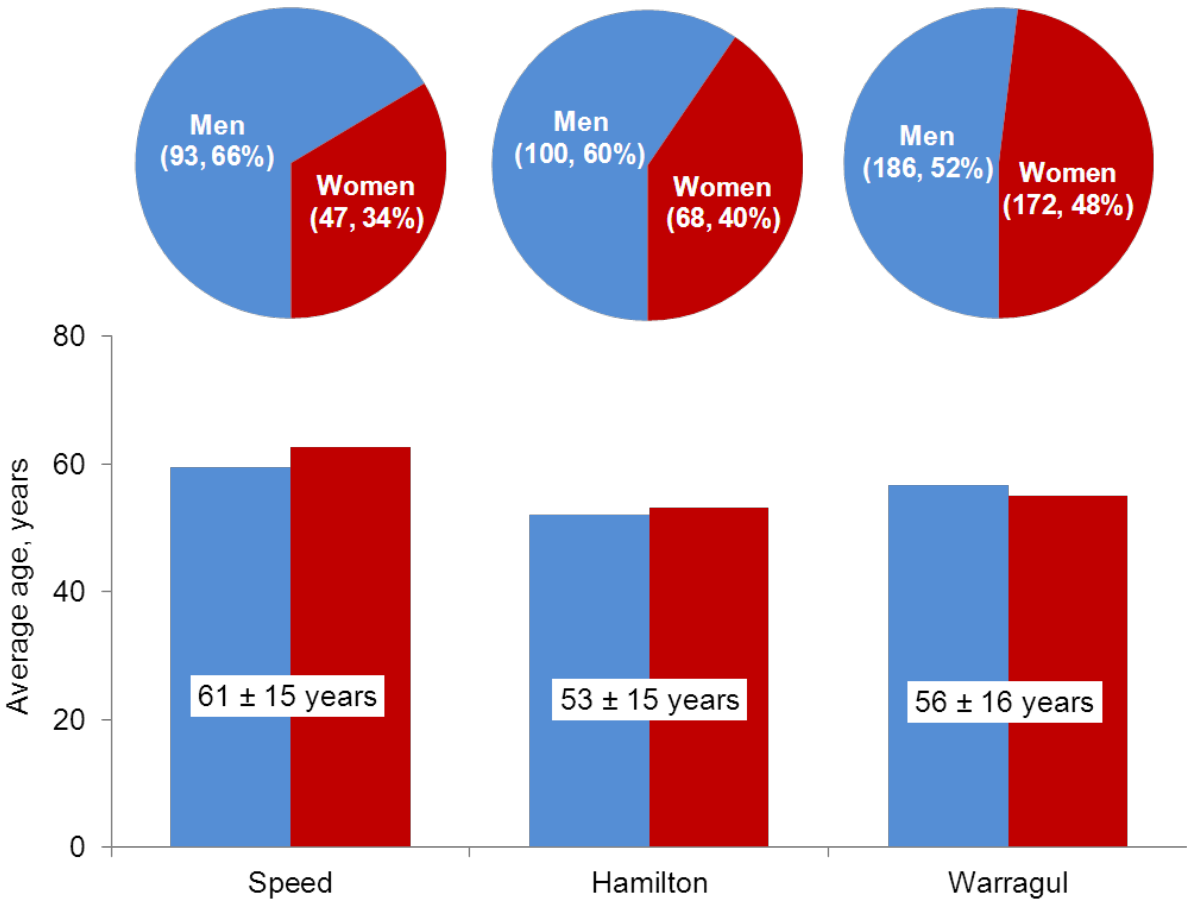
Results

Health assessment data from all participants who were over the age of 18 years (no upper age limit) at the time of attendance to the three Victoria regional agricultural shows between August 2013 and March 2014 were included in the current report.

Gender and age distribution

A total of 667 people (379, 57% male) volunteered to have a health risk assessment (Speed Mallee Machinery Field Days, n=140; Hamilton Sheepvention, n=168, and Warragul Farm World, n=359). The average age of those assessed was 56 ± 16 years; an older sample were screened at Speed (61 ± 15 years) and a younger sample (53 ± 15 years) at Hamilton (**Figure 6**).

Figure 6 Gender and age distribution of participants at each field event

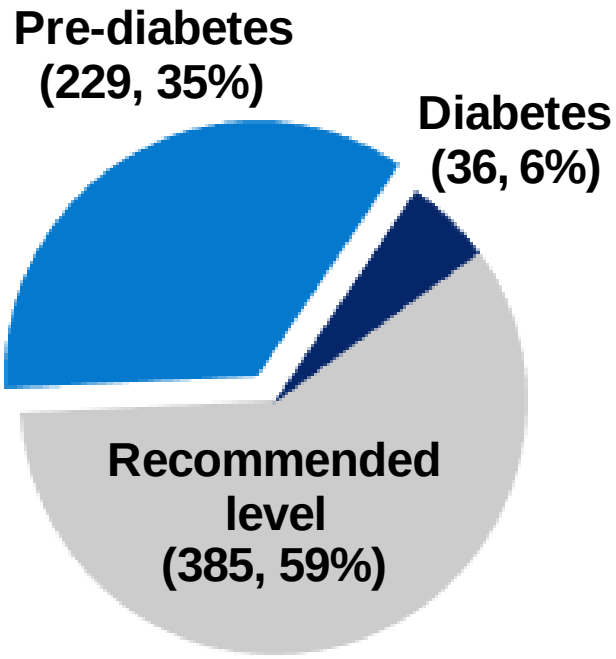


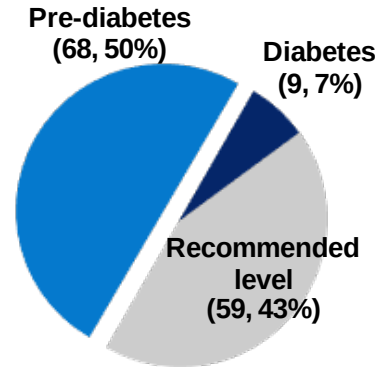
Diabetes and CVD

Previous history of diabetes (n=31, 5%) and CVD (n=52, 8%) were low among the field day participants. The average HbA_{1c} was 5.7 ± 0.6 %.

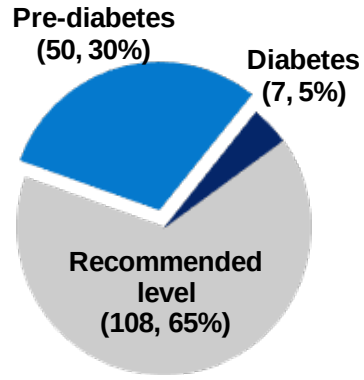
As shown in **Figure 7**, there were 36 (6%) individuals who had probable diabetes ($HbA_{1c} \geq 6.5\%$). According to the latest recommendation by the American Diabetes Association for the diagnosis and classification of diabetes[11], approximately one in three (229, 35%) participants were found to be in the pre-diabetes range (HbA_{1c} between 5.7 to 6.4%). The highest proportion (68, 50%) were those who attended the health checks at the Speed Mallee Machinery Field Days, whilst smaller proportions were identified at Hamilton Sheepvention (50, 30%) and Warragul Farm World (111, 32%). Of concern, those participants who self-reported diabetes, only one in three (n=13, 36%) achieved the ideal HbA_{1c} levels (**Figure 7**).

Figure 7 Classification of individuals by HbA_{1c}

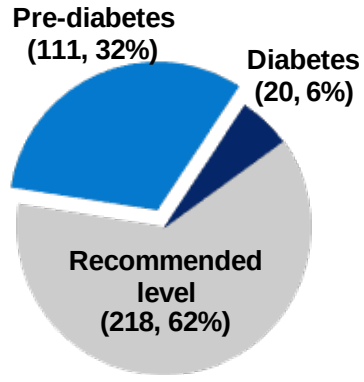




Speed



Hamilton



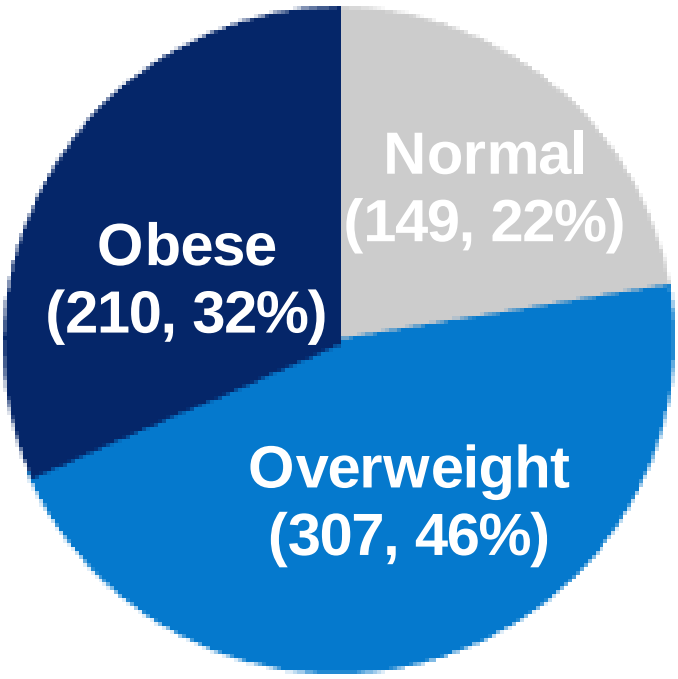
Warragul

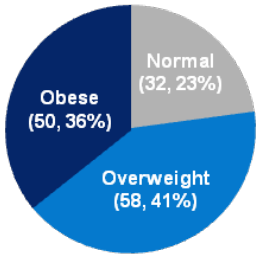
Body fatness

Figure 8 summarises the body fat assessment of the participants according to BMI and waist circumference (abdominal obesity). The average BMI was 28.5 ± 5.1kg/m^2; nearly half (307, 46%) were overweight and a further one in three (210, 32%) were in the obese category (refer to **Table 3**). In relation to waist circumference measurements, 341 (51%) participants were at high risk for obesity-related metabolic complications associated with abdominal fatness while another one in three (193, 29%) were at increased risk. Men were more likely than women to be overweight (84% *versus* 67%), however more women than men were at an increased risk of deposition of abdominal body fat (85% *versus* 78%).

Figure 8 Classification of individuals by body fatness

Body mass index





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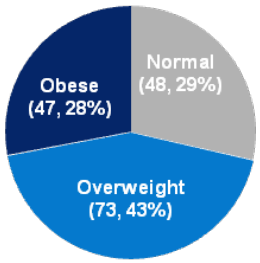

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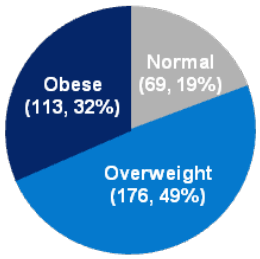
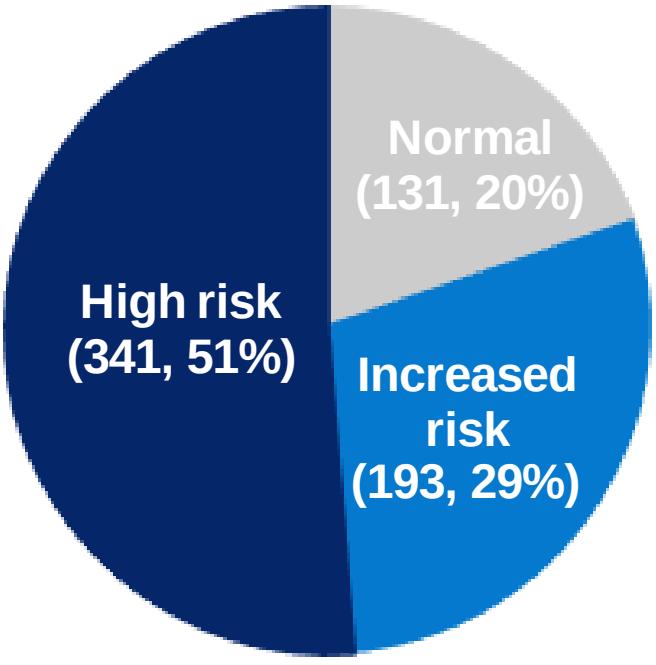
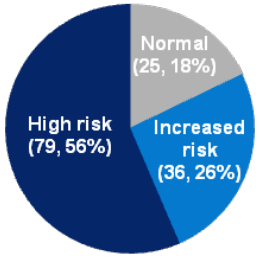


Warragul

Abdominal obesity





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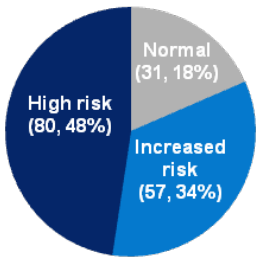
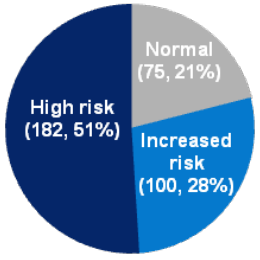


Hamilton

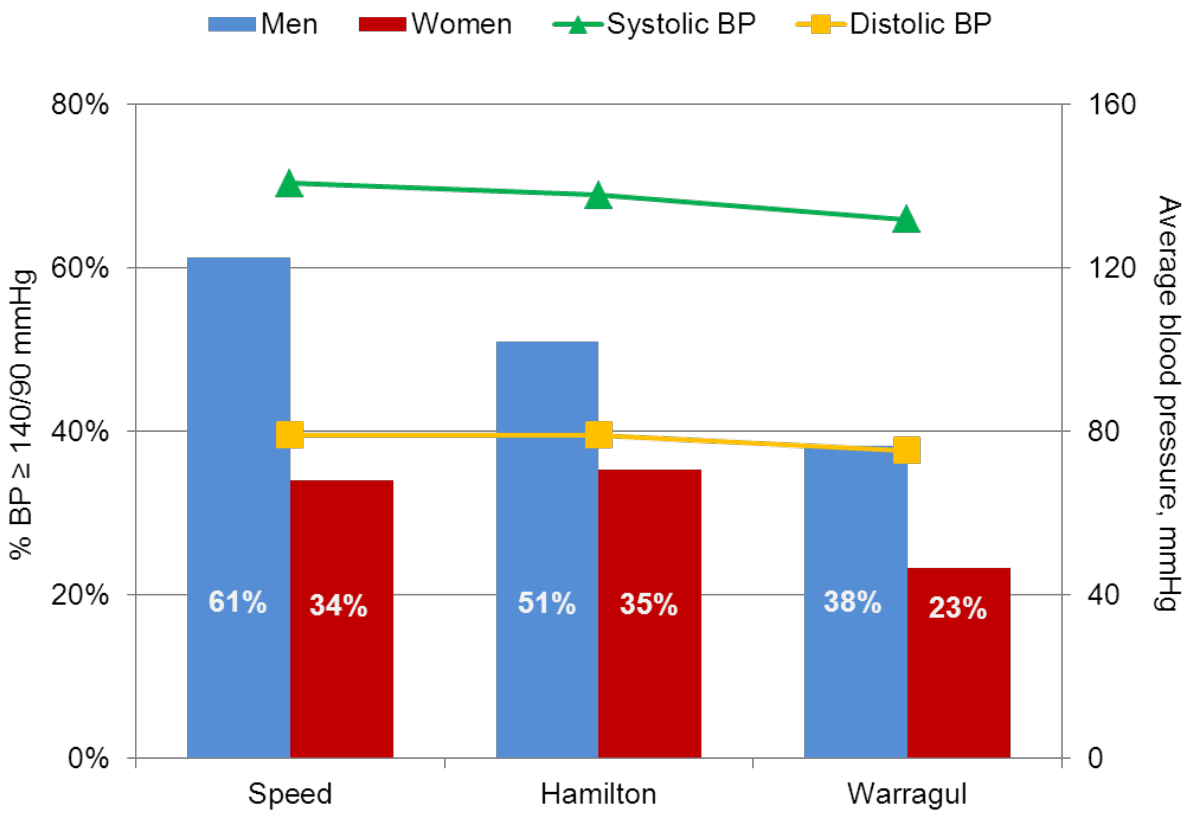


Warragul

Blood pressure

The average systolic and diastolic blood pressures were 135 ± 18 and 77 ± 12 mmHg, respectively. More than one in three (259, 39%) participants had elevated blood pressure >140/90mmHg (see **Table 2**). Overall, there were clear differences in gender and region differences in hypertension prevalence. More men had elevated blood pressure than women [179 [47%] men *versus* and 80 [28%] women]. The highest percentage of hypertensive individuals screened was at the Hamilton Sheepvention (73, 52%) whilst those who attended the Warragul Farm World event had the lowest rate of hypertension (111, 31%).

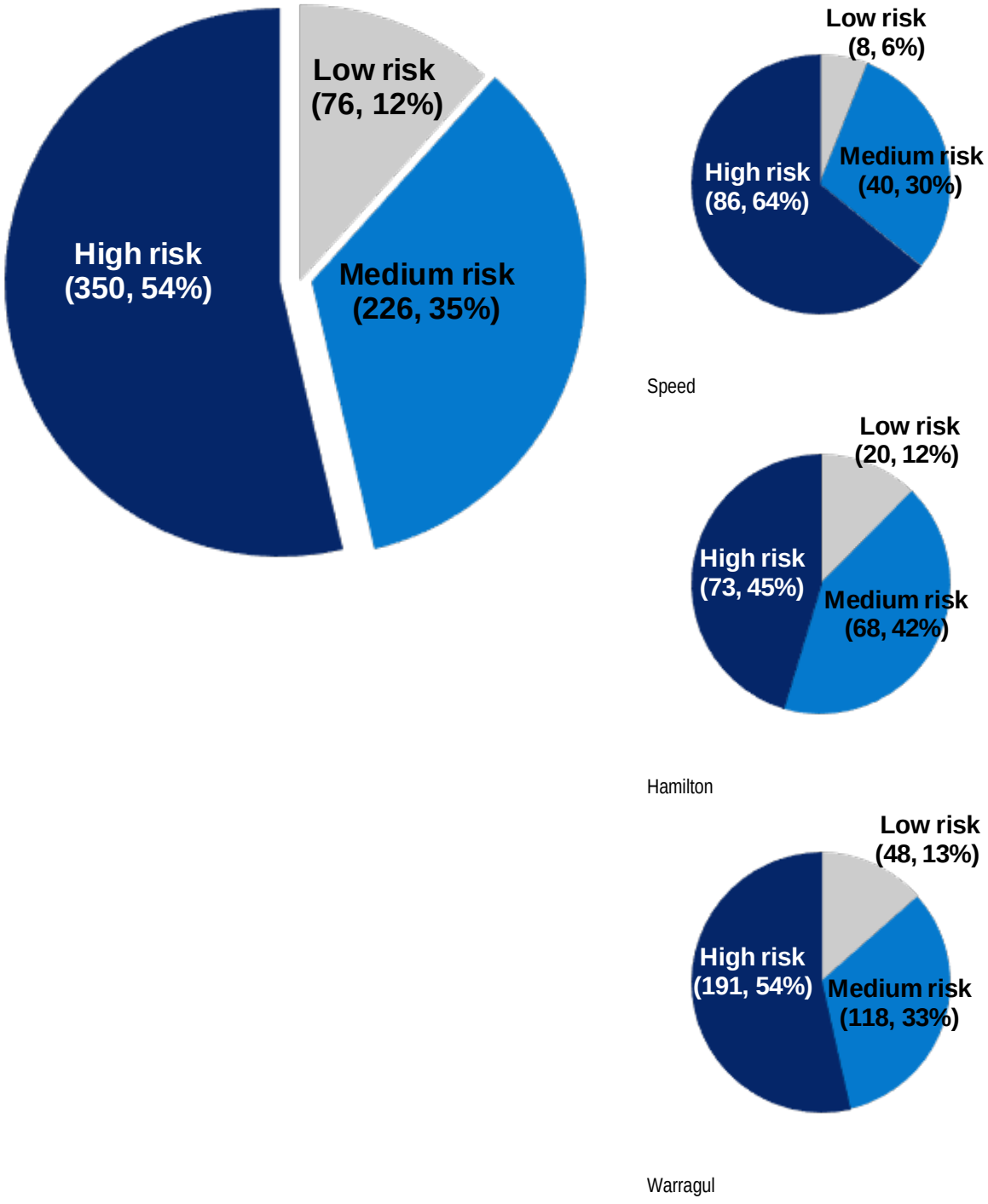
Figure 9 Average blood pressure and percentage of individuals with elevated blood pressure



AUSDRISK

The average AUSDRISK score was 12 ± 6 points. Participants from the Speed Mallee Machinery Field Days had a significantly higher average AUSDRISK score (14 ± 6) compared with those from the other two events (12 ± 6). **Figure 10** shows that overall, more than half (350, 54%) of the participants screened were deemed at high risk of developing diabetes within the next five years. Another 226 (35%) individuals were found to be at medium risk, indicating a 2 to 3% probability of developing diabetes within the next five years.

Figure 10 Classification of individuals by AUSDRISK



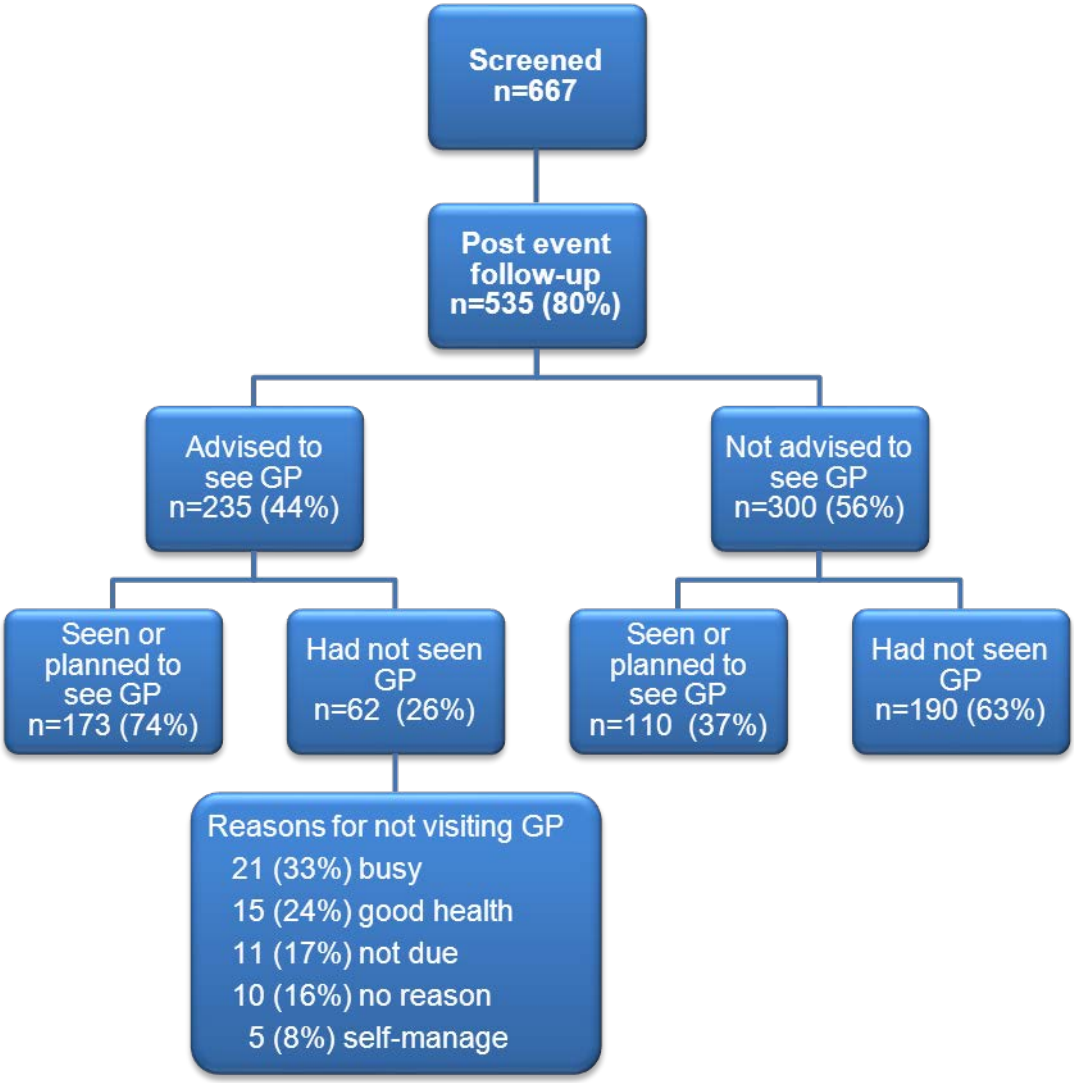
Post-event follow-up

Figure 11 summarises the contact made by Baker IDI cardiac nurses to 80% (535/667) of all attendees to the RFDS field day health assessments. Based on the results of the assessment, 235 (44%) participants were advised to see their doctor. Of those, 173 (74%) individuals had seen or made plans to see their GP at the time of survey. Older individuals and proportionally more women than men were more likely to visit their GP. Of people who visited their GP, ten (6%) received additional multidisciplinary care including referral to a medical specialist (4%), community nurse (3%) and dietitian (1%).

Of people who had not seen their GP, around one in three (33%) said they were too busy, 24% felt they were in good health, 17% reported they would wait until their next routine GP appointment and a further 8% claimed they self-managed their condition(s).

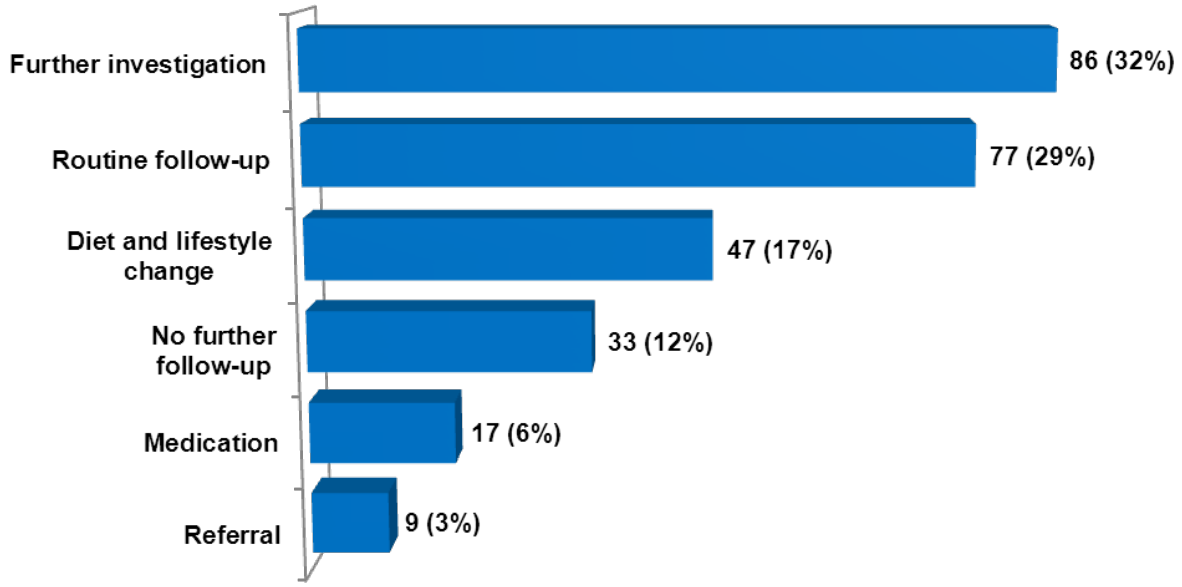
Of those (n=300, 56%) who were not advised to visit their GP based upon their results from the field day event, around one in three (37%) people had visited a healthcare professional within one month post-event.

Figure 11 Post-event follow-up response



As shown in **Figure 12** nearly a third (n=86, 32%) of participants who visited their doctor received additional tests and/or further investigations, more than a quarter (n=77, 29%) needed routine monitoring, 47 (17%) participants were encouraged to make dietary and lifestyle changes, 17 (6%) required initiation or titration of medications and nine (3%) were referred to other healthcare professionals.

Figure 12 Medical recommendations upon follow-up



The overall rating for the RFDS health assessment program from attendees was 8.7 ± 1.1 points. The majority of responders (468/532, 88%) found the program to be most useful and informative (scoring ≥ 8/10). Many who gave a lower score (≤ 5/10) cited that they already knew about their pre-existing medical conditions and therefore did not find the assessment useful.

There were no differences in the overall rating between the three show events, however women were more likely than men to provide a higher score (8.7 ± 1.2 *versus* 8.6 ± 1.1).

Conclusions

The RFDS Victoria Outreach Health Assessment Program was well received among attendees to the three regional shows and attracted multiple local media coverage both before and after the event. The program provided individuals with access to a free diabetes and brief CVD risk assessment that would not have been provided otherwise. It raised awareness about diabetes and CVD among regional Victorian communities. The program detected some potentially serious hidden risk factors in people living in regional Victoria (one in three had hypertension and/or prediabetes). The program provided an opportunity to identify those high-risk residents and encourage them to seek additional care. Many of whom took action (more than two thirds, 74%) and received additional tests and/or further investigations from their GP. There was also evidence of the 'worried well' seeking reassurance both from undergoing a health check and following up with their GP.

The pre-trained volunteer medical student model worked well and was effective in providing the health screening in outreach community settings. Participants received a free health check with face-to-face discussion/education and tips to improve or maintain one's general health and wellbeing. Short term gains were seen, however the sustainability of improved risk over the longer term is unknown.

Limitations

We aimed to collect a large community sample with people of most ages, gender and ethnicity; however this was a self-selected cohort and might not be fully representative of the regional Victorian population. As much as we tried to control/standardise the screening process, the assessments were conducted outdoors in a non-clinical setting and weather conditions varied between each event. At the time of conducting the telephone follow-up, it was not possible for the cardiac nurse to verify what participants were told, or if they were advised to seek further care during the initial assessment.

Despite these limitations, the overall findings of this report were in accordance with previous evidence showing residents living in regional or remote areas have higher levels of antecedent risk for developing diabetes and premature heart disease. Screening programs, such as the RFDS Victoria

Outreach Health Assessment Program, are required to detect and intervene early to help manage risk factors and prevent the escalation in diabetes and CVD rates in Australia.

Recommendations

To work collaboratively with local health providers to use the screening tools in their everyday practice and at other more local events.

To further explore the utilisation of university students from a relevant health discipline at future screening events to the benefit of both the program and the students

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Presenter

With an extensive career in nursing, **Margaret Kuhne** has moved from the wards to the boardroom. In her role as Director of Community Health for South Gippsland Hospital Margaret managed all aspects of the community health service. She has extensive experience in health quality and came to Royal Flying Doctor Service Victoria as Clinical and Quality Manager. In her current role as Acting General Manager of the Primary Health department within the Royal Flying Doctor Service Victoria, Margaret is responsible for developing new health service programs and partnerships and oversees existing primary health initiatives for the organisation.