



Aus-ROC

Australasian Resuscitation Outcomes Consortium

EPISTRY

Annual Report
2024



This report was produced on behalf of The Australasian Resuscitation Outcomes Consortium

Contact:
Professor Janet Bray
School of Public Health and Preventive Medicine
Monash University
553 St Kilda Rd
Melbourne VIC 3004

P: +61 9903 0177
E: janet.bray@monash.edu.au

Abbreviations

ACT	Australian Capital Territory
ASIR	Age-Standardised Incidence Rates
Aus-ROC	Australasian Resuscitation Outcomes Consortium
CPR	Cardiopulmonary resuscitation
EMC	Epistry Management Committee
EMS	Emergency Medical Services
HREC	Human Research Ethics Committee
ILCOR	International Liaison Committee on Resuscitation
NHMRC	National Health and Medical Research Council
NSW	New South Wales
NT	Northern Territory
NZ	New Zealand
OHCA	Out-of-Hospital Cardiac Arrest
PCI	Percutaneous Coronary Intervention
PCR	Patient Care Records
QLD	Queensland
ROSC	Return of Spontaneous Circulation
SA	South Australia
TAS	Tasmania
VF	Ventricular Fibrillation
VIC	Victoria
VT	Ventricular Tachycardia
WA	Western Australia

Table of contents

Item	Page
Acknowledgements	5
Executive Summary	6
Epistry Management Committee	8
Cardiac arrest outcomes in Australia and New Zealand 2022	9
Aus-ROC Epistry	10
Purpose	10
Data Capture	10
Data management and governance	11
Ethics	11
Mandatory Variables	12
Epistry partners	13
Epidemiology of OHCA in Australia and New Zealand 2022	15
Incidence of attended OHCA by country 2022	16
Characteristics of attended OHCA cases by country 2022	17
EMS resuscitated patient outcomes 2022	18
Publications and Grants	19
References	20



Acknowledgements



Aus-ROC Australian and New Zealand Out-of-Hospital Cardiac Arrest Epistry (Aus-ROC Epistry) has been funded by grants from the National Health and Medical Research Council (NHMRC) and the Heart Foundation. The Epistry is coordinated and located in the School of Public Health and Preventive Medicine (SPHPM) at Monash University, Australia.

We gratefully acknowledge contributions made by the Epistry Management Committee. We acknowledge the Epistry Academic Lead, Professor Janet Bray, Clinical Lead, Professor Peter Cameron and Registry Manager, Dr Stuart Howell.

The Epistry would not be possible without the partnership of Ambulance Services across Australia and New Zealand and staff who provide data to the Epistry.

Executive Summary

In 2024, the Aus-ROC Australia and New Zealand OHCA Epistry has continued its mission to enhance the understanding and management of out-of-hospital cardiac arrest (OHCA) through high-quality data collection, analysis, and collaborative research across Australia and New Zealand. This year, the Aus-ROC Epistry maintained its reputation as a vital resource for advancing OHCA research and improving patient outcomes.

2024 Highlights

In 2024, the Epistry contributed to the publication of impactful research, including:

- **Identifying Areas with High OHCA Incidence and Low Bystander CPR Rates.** This observational study pinpointed Australian regions with elevated OHCA incidences and low bystander CPR rates, providing critical insights for targeted interventions. Published in PLOS ONE, the study emphasises the need for community-specific strategies to improve bystander response. This paper generated significant interest from the media and was picked up by >200 outlets, including television and radio interviews (e.g. ABC News, regional ABC radio, SBS).

The Aus-ROC Epistry's research excellence was recognised with substantial grant support in 2024, including:

- **NHMRC Aus-ROC Centre of Research Excellence (#2035259):** National Health and Medical Research Council (NHMRC) Centre of Research Excellence (CRE) funding of \$3,000,000 for 2025-2029. This Aus-ROC CRE aims to optimise the emergency response to save lives. The research will investigate comprehensive solutions to improve bystander and EMS response to OHCA, incorporating innovative health strategies and cutting-edge technology to enhance the emergency response.
- **Developing a National Strategy for Improving OHCA Outcomes:** Heart Foundation Vanguard funding of \$150,000 for 2024-2025. The Aus-ROC Epistry Management Committee aims to use innovative mathematical simulations to predict the impact of potential intervention strategies on lives saved in every LGA across Australia.
- **The Impact of EMS Agency Factors and Resuscitation Practice on OHCA Outcomes Across Australia and New Zealand:** Australian Resuscitation Council funding of \$20,000 for 2024-2025. This project examines the influence of EMS agency factors and resuscitation practices on OHCA outcomes across Australia and New Zealand.

International collaboration and contributions

The Epistry again shared collated data with the International Liaison Committee on Resuscitation's (ILCOR) global OHCA database, and we look forward to seeing the data published in 2025. In 2024, I was fortunate to lead with members of our Epistry Management Committee, Judith Finn, Ziad Nehme and Bridget Dicker, the update of the ILCOR OHCA Utstein template, which has been co-published in the journals Resuscitation and Circulation.

Management Committee

We extend our gratitude to the members of the Epistry Management Committee for their dedication and leadership throughout the year. The following members departed in 2024:

- Melanie Thorrowgood (SA Ambulance Service)
- Mr Rudi Brits St John Ambulance WA
- Sam Perillo (ACT Ambulance)
- Natalie Heriot (Ambulance Victoria)

Their contributions have been instrumental in shaping the direction and success of the Epistry. We wish them the best in their future endeavours.

Looking Ahead

In 2025, the Epistry will focus on:

- Broadening data collection to include more data from the 2024 ILCOR Utstein OHCA Template.
- Strengthening collaborations with our ambulance services and community organisations to address disparities in OHCA care.
- Pursuing new research opportunities to inform guidelines and policies that enhance OHCA survival and recovery.

The achievements of 2024 reflect the unwavering commitment of our contributors, collaborators, and supporters to improving outcomes for OHCA patients. We thank all stakeholders for their continued partnership in this vital work.



Professor Janet Bray
Aus-ROC Epistry Academic Lead

Epistry Management Committee

The management committee oversees all use of the Aus-ROC Epistry data. They meet quarterly and hold definition meetings in between.

Members

Prof Janet Bray (Monash University) -Chair
Dr Stuart Howell (Monash University) -Manager
Prof Peter Cameron (Monash University)
Prof Judith Finn (Curtin University/St John Ambulance WA)
Dr Steve Ball (Curtin University/St John Ambulance WA)
Mr Joe Cuthbertson (St John Ambulance WA)
Dr Ziad Nehme (Ambulance Victoria)
Ms Ashanti Dantanarayana (Ambulance Victoria)
Prof Emma Bosley (Queensland Ambulance Service)
Dr Tan Doan (Queensland Ambulance Service)
Mr Omid Dadras (Queensland Ambulance Service)
Prof Bridget Dicker (St John Ambulance NZ)
Prof Tony Smith (St John Ambulance NZ)
Ms Heather Hutchinson (St John Ambulance NZ)
Prof Andy Swain (Wellington Free Ambulance)
Mr Gus Feltham (Wellington Free Ambulance)
Dr Amy Keir (SA Ambulance Service)
Ms Usha Raamkummar (SA Ambulance Service)
Mr Steve Faddy (NSW Ambulance)
Ms Nicole Packham (NSW Ambulance)
Mr Mike McDermott (Ambulance Tasmania)
Mr Matt Green (Ambulance Tasmania)
Mr Andrew Thomas (St John Ambulance NT)
Ms Donna Winkworth (St John Ambulance NT)
Ms Irene Herrero (ACT Ambulance)
Prof Gavin Perkins (Warwick University, UK)
Mr Jeff Waters (Consumer Representative)

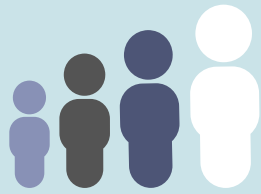
*As of December 2024

Cardiac arrest outcomes in Australia and New Zealand 2022



38646

Total number of cardiac arrests



69

Median Age
IQR (55-81)



65.3%

Male
N=25219

11.6%



Shockable Rhythm
N=4497



26.4%

Bystander Witnessed
N=10188



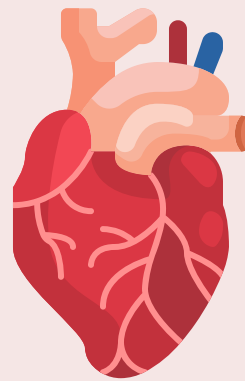
37.6%

Bystander CPR
N=13362



1.9%

AED
N=686



82.1%

Medical aetiology
N=31739

12.1%

Public location
N=4677



40.1%

N=15511

EMS attempted resuscitation



25.2%

Event survival
N=3905

Bystander witnessed/shockable rhythm
(including AED shock and ROSC)

11.1%

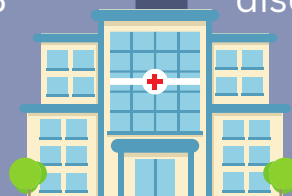
OHCA Survival to
discharge/30days
N=1673

45.7%

Event survival
N= 1093

30.0%

OHCA Survival to
discharge/30days
N=712



Purpose

Our mission is to produce high quality, collaborative research to advance the evidence base across the chain of survival for cardiac arrest. This mission relies heavily on the development and maintenance of the Aus-ROC Epistry. While individual OHCA registries have long been established by ambulance services in most states in Australia and across New Zealand, the combining of these registries was hindered by a lack of infrastructure to host the data and ensure a consensus of definitions and standardisation.¹ Designed as a population-based cohort study the main purpose of the Epistry was to combine established registries across Australia and New Zealand to further understand regional variation in OHCA incidence and outcomes, the influence of different ambulance service structures and patient factors associated with survival. At the Epistry's inception in 2015, there were six contributing regional Emergency Medical Services (EMS) covering 64% of the Australian population and 100% of the New Zealand population. Since then two additional EMS have joined the Epistry resulting in 100% coverage of the Australian and New Zealand population.²

Data Capture

Details for Epistry Data collection are fully described elsewhere¹ and have been summarised here. Epistry data is collected from individual EMS registries across eight Australian and two New Zealand EMS.

Data capture of OHCA cases varies between ambulance services. A combination of electronic queries of patient care records (PCRs), manual sorting through PCRs, staff standardised reporting and dispatch codes are used to identify OHCA cases. For those ambulance services that use electronic queries, subsequent manual searches and auditing are conducted by all services to maximise case capture. Hospital outcomes data are commonly obtained through linkage with hospital records and state based death registries. In one region, hospital outcomes are obtained through linkage with the state Department of Health data.

To ensure consistency, data across all participating sites are collected in accordance with Ustein-style definitions.³ All OHCA attended by ambulance, regardless of aetiology, are included in the Epistry. All deaths attended by ambulance are classified as OHCA and thus included in the Epistry. Mandatory variables included in the Aus-ROC Epistry are listed in Table 1 and were identified by consensus among participating services. The data includes information on the case overview, demographics, arrest features, dates and time of the event, treatment and outcomes, with the primary outcome "survival to hospital discharge" or 30-day survival.

Data management and governance

The Epistry is coordinated and located in the School of Public Health and Preventive Medicine at Monash University, Australia. Data capture, case ascertainment and quality control is the responsibility of each participating ambulance service. Data are transferred from each ambulance service to Monash University using a web-based secure file transfer protocol and stored on a secure server at Monash University. Epistry staff at the university are responsible for recoding data to ensure consistency with the Epistry data dictionary. Epistry oversight, including processes, protocols and ethics compliance is overseen by the Epistry Management Committee, members of the committee are listed on page 7 and include representatives from each of the contributing ambulance services and Aus-ROC investigators. The Epistry consensus governance document guides the committee on the agreed use of the Epistry data, while maintaining data security and ensuring ethics compliance.

Ethics

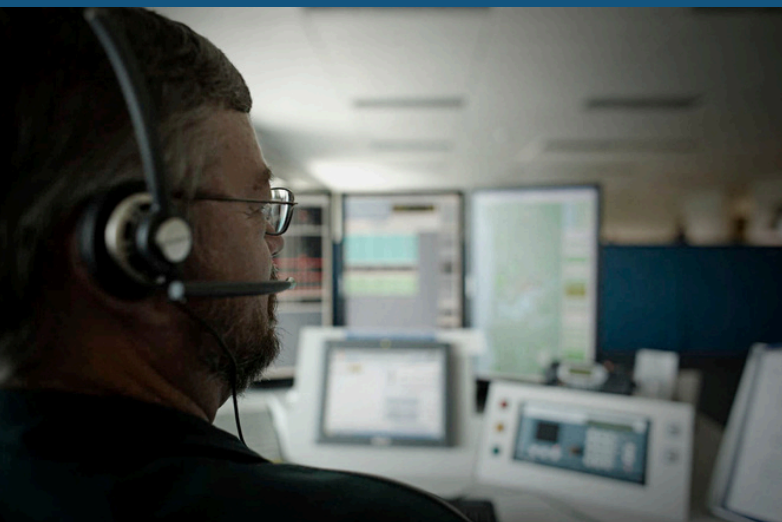
Ethics approval for the Epistry is provided by Monash University HREC (Approval No. CF12/3938-2012001888). Data provided to the Epistry is de-identified and can only be re-identified by each individual jurisdiction using a unique identifier if required to cross-check individual cases.



Mandatory Variables

Table 1: Mandatory Epistry variables¹

Case overview	Unique Aus-ROC case identifier Event date Longitude coordinate of event Latitude coordinate of event
Demographics	Age Age qualifier Sex Location of arrest
Arrest features	Witnessed arrest Bystander CPR First arresting rhythm Aetiology of arrest
Dates and times	Date and time of call received Date and time arrive at scene (first) Date and time depart scene (transporting ambulance) Date and time arrival hospital (transporting ambulance)
Treatment	Ambulance service resuscitation attempt Ambulance service defibrillation Defibrillation before ambulance service Total number of shocks Airway (final) Mechanical CPR
Outcomes	Any ROSC Scene outcome Survived event (ROSC on hospital handover) Survival to discharge / 30 days Date of discharge / death Discharge disposition Receiving hospital (PCI capability)



Epistry partners



The ten EMS services that contribute to the Epistry together cover a land area of 7.96 million km² and a population of approximately 30 million people. In Australia, each state or territory is covered by one EMS and in New Zealand one EMS (St John New Zealand) covers most of the country, with the other EMS covering the Greater Wellington region.

Table 2: Land and population coverage of Ambulance services

Region	Ambulance service	Population size* ^{4,7}	Geographical area (km ²) ^{6,7}
AUSTRALIA		27 204 809	7 688 287
New South Wales	NSW Ambulance	8 484 400	801 150
Victoria	Ambulance Victoria	6 981 400	227 444
Queensland	Queensland Ambulance Service	5 586 300	1 729 742
South Australia	SA Ambulance Service	1 878 000	984 321
Western Australia	St John Western Australia	2 965 200	2 527 013
Tasmania	Ambulance Tasmania	575 400	68 401
Northern Territory	St John Ambulance NT	255 100	1 347 791
Australian Capital Territory	ACT Ambulance	474 100	2 358
NEW ZEALAND		5,348,600	268 315
NZ (excl. Wellington)	St John New Zealand	4 827 629	260 726
Wellington	Wellington Free Ambulance	520 971	7 589

* latest published population data





Epidemiology of OHCA in Australia and New Zealand 2022



Data presented in the following tables and graphs is from the 2022 calendar year.



Australia

Geographical Area (km ²)		7 688 220
Population		27 204 809
Incidence		123.8
Number of cases attended (N)		32 213
EMS attempted resuscitation n (%)		13 143 (40.8%)

5 249 629



New Zealand

268 315		Geographical Area (km ²)
5 348 600		Population
125.7		Incidence
6 433		Number of cases attended (N)
2 368 (36.8%)		EMS attempted resuscitation n (%)

Median age



70 years
(55-81)



67 years
(54-79)

EMS Response times



10.0 mins
(7.0-16.4)



11.2mins
(7.8-18.6)

Children <18 years



Bystander CPR



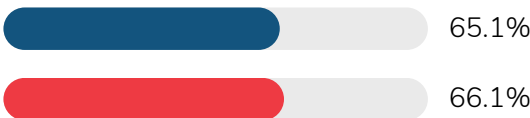
Adults (18+years)



Shockable (VF/VT/US)



Male



Bystander defibrillation



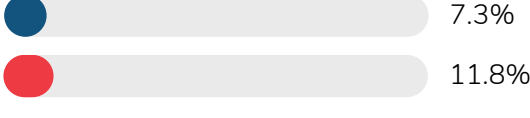
Private residence



Medical



EMS witnessed



Non-Medical



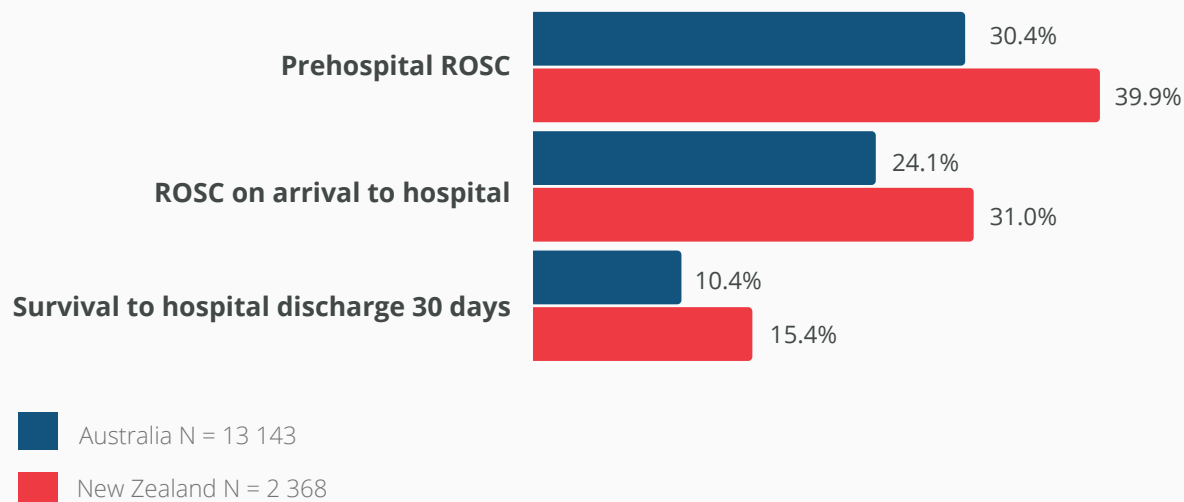
Bystander witnessed



● Australia
● New Zealand

EMS resuscitated patient outcomes 2022

Outcomes of OHCA cases that received attempted resuscitation from EMS personnel (*including AED shock and ROSC*) by country 2022



Outcomes of OHCA cases (bystander witnessed, shockable rhythm) 2022

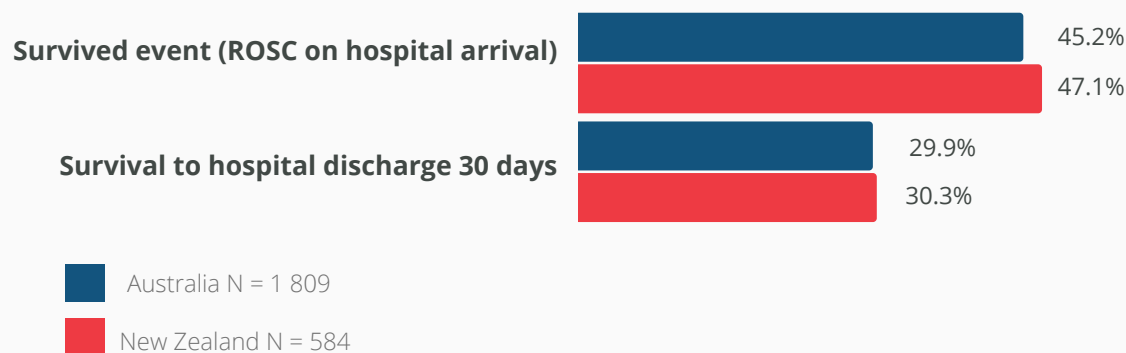


Table 3: Cases that received attempted resuscitation by EMS personnel 2022

Characteristic	Australia N = 13 143	New Zealand N = 2 368
Patients who achieved prehospital ROSC	4 001	946
ROSC on hospital arrival	3 172	733
Survived to hospital discharge/30 days	1 309	364
<i>Outcomes: bystander witnessed shockable rhythm</i>		
	N = 1 809	N = 584
Survived event (ROSC on hospital arrival)	818	275
Survived to hospital discharge/30 days	535	177

Publications using Epistry data

Doan T, Howell S, Ball S, Finn J, Cameron P, Bosley E, Dicker B, Faddy S, Nehme Z, Heriot N, Swain A, Thorrowgood M, Thomas A, Perillo S, McDermott M, Smith T, Smith K, Belcher J, Bray J, on behalf of the Aus-ROC OHCA Epistry Management Committee. Identifying areas of Australia with high out-of-hospital cardiac arrest incidence and low bystander cardiopulmonary resuscitation rates: A retrospective, observational study. *Plos One* 2024; 19:e0301176.

Howell S, Smith K, Finn J, Cameron P, Ball S, Bosley E, Doan T, Dicker B, Faddy S, Nehme Z, Swain A, Thorrowgood M, Thomas A, Perillo S, Green M, Bray J, on behalf of the Aus-ROC OHCA Epistry Management Committee. The development of risk adjustment models for benchmarking of emergency medical services in Australia and New Zealand. *Resuscitation* 2023;188:109847.

Nishiyama C, Kiguchi T, Okubo M, Alihodžić H, Al-Araji R, Baldi E, Beganton F, Booth S, Bray J, Burkart R, Christensen E, Finn J, Grasner JT, Jouven X, Kern KB, Maconochie I, Masterson S, McNally B, Nolan JP, Ong MEH, Perkins GD, Park JH, Ristau P, Savastano S, Shahidah N, Shin SD, Soar J, Tjelmeland I, Quinn MO, Wyckoff MH, Iwami T on behalf of the ILCOR Research and Registries Working Group. Three years trend of out-of-hospital cardiac arrest across the world: second report from the International Liaison Committee on Resuscitation (ILCOR). *Resuscitation*. 2023;186:10975

Bray J, Howell S, Ball S, Doan T, Bosley E, Smith K, Dicker B, Faddy S, Thorrowgood M, Swain A, Thomas A, Wilson A, Shipp C, Walker T, Bailey P, Finn J on behalf of the Aus-ROC Epistry Management Committee. The epidemiology of out-of-hospital cardiac arrest in Australia and New Zealand: A binational report from the Australasian Resuscitation Outcomes Consortium (Aus-ROC). *Resuscitation* 2022;172:74-83.

Beck B, Bray J, Cameron P, Smith K, Walker T, Grantham H, Hein C, Thorrowgood M, Smith A, Inoue M, Smith T, Dicker B, Swain A, Bosley E, Pemberton K, McKay K, Johnston-Leek M, Perkins GD, Nichol G, Finn J on behalf of the Aus-ROC Steering Committee. Regional variation in the characteristics, incidence and outcomes of out-of-hospital cardiac arrest in Australia and New Zealand: results from the Aus-ROC Epistry. *Resuscitation* 2018;126:49-57.

Grants

- National Health and Medical Research Council (NHMRC) Centre of Research Excellence (CRE) (\$3,000,000) 2025-2029
- Heart Foundation Vanguard (\$150,000) 2024-2025
- Australian Resuscitation Council (\$20,000) 2024-2025

References

1. Beck B, Bray J, Smith K, Walker T, Grantham H, Hein C, et al. Establishing the Aus-ROC Australian and New Zealand out-of-hospital cardiac arrest Epistry. *BMJ Open*. 2016 Apr;6(4):e011027.
2. Bray J, Howell S, Ball S, Doan T, Bosley E, Smith K, et al. The epidemiology of out-of-hospital cardiac arrest in Australia and New Zealand: A binational report from the Australasian Resuscitation Outcomes Consortium (Aus-ROC). *Resuscitation*. 2022 Mar;172:74–83.
3. Bray JE, Grasner JT, Nolan JP, Iwami T, Ong MEH, Finn J, McNally B, Nehme Z, Sasson C, Tijssen J, Tjelmeland I, Wnent J, Dicker B, Nishiyama C, Doherty Z, Welsford M, Perkins GD. Cardiac Arrest and Cardiopulmonary Resuscitation Outcome Reports: 2023 Update of the Utstein Out-of-Hospital Cardiac Arrest Registry Template: A Consensus Statement from the Registry and Research Committee of the International Liaison Committee on Resuscitation. *Circulation* 2024;150:e203-e223
4. Australian Bureau of Statistics. (2024, June). National, state and territory population. ABS. <https://www.abs.gov.au/statistics/people/population/national-state-and-territory-population/latest-release>.
5. Stats NZ. Subnational population estimates: 20 November 2024 | Stats NZ [Internet]. www.stats.govt.nz. [cited 2024 Dec 17]. Available from: <https://www.stats.govt.nz/indicators/population-of-nz/>
6. Geoscience Australia. Area of Australia - States and Territories [Internet]. [Ga.gov.au](https://www.ga.gov.au). Geoscience Australia; 2018. [cited 2024 Dec 17] Available from: <https://www.ga.gov.au/scientific-topics/national-location-information/dimensions/area-of-australia-states-and-territories>
7. Stats NZ. Population density table. [Govt.nz](https://www.stats.govt.nz). 2019. [cited 2024 Dec 17] Available from: <https://www.stats.govt.nz/>



*To ensure more people
survive cardiac arrest and live well.*



Aus-ROC
Australasian Resuscitation Outcomes Consortium