

# Differences in life expectancy within and between countries: implications for domestic TAVI guidelines in Australia and Aotearoa New Zealand

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## ABSTRACT

The advent of transcatheter aortic valve implantation (TAVI) has caused a paradigm shift in the management of aortic stenosis away from traditional surgical aortic valve replacement (SAVR). However, uncertainty remains about the long-term (>10 year) durability of TAVI valves, especially in younger patients. This viewpoint collates life expectancy data from Australia and Aotearoa New Zealand to propose sex-specific age-based recommendations for choice of SAVR versus TAVI in their respective general populations and among Aboriginal and Torres Strait Islander people in Australia and both Māori and Pacific peoples living in Aotearoa New Zealand.

The 2020 ACC/AHA Guideline for the Management of Patients with Valvular Heart Disease expresses its recommendations for bioprosthetic aortic valve replacement in terms of both age and life expectancy.<sup>1</sup> Specifically, surgical aortic valve replacement (SAVR) is recommended for patients who are <65 years of age and for older patients with a life expectancy >20 years. Transcatheter aortic valve implantation (TAVI) is recommended for patients who are >80 years of age and for younger patients with a life expectancy <10 years. Shared decision making is recommended in the grey zone in between (age 65–80 and life expectancy 10–20 years). The accompanying synopsis and recommendation-specific supportive text make it clear that the life expectancy-based recommendation is the primary recommendation. This reflects the fact that life expectancy modulates the risks associated with the uncertainties of TAVI valve durability. The breakpoints in the age-based recommendation are derived by applying the life expectancy-based recommendation to life expectancy data for the United States of America's unisex general population and are only included to make discussion of the issue of life expectancy more accessible to patients during shared decision making. The 2021 ESC/EACTS Guidelines for the management of valvular heart disease takes a similar approach, emphasising that it uses age as a surrogate for life expectancy, which it notes varies widely across the world.<sup>2</sup>

The aim of the study reported in this viewpoint was to collate life expectancy data for Australia and Aotearoa New Zealand for the purpose of generating sex-specific age-based criteria for use in any future domestic TAVI guideline. Life expectancy data for the United States of America and the European Union were also collected to better contextualise the existing international guidelines.

We obtained the life expectancy data from Life Tables published by the relevant government agency in each country.<sup>3–7</sup> To avoid the (hopefully) transient impact of the COVID-19 pandemic on the mortality rates that underpin the production of period Life Tables, we chose the most recent Life Table that had been derived from pre-2020 data. To generate age-based recommendations within each population studied, we identified the oldest age with a life expectancy >20 years and the youngest age with a life expectancy <10 years, which is consistent with the approach taken in the 2020 ACC/AHA Guideline for the Management of Patients with Valvular Heart Disease.<sup>1</sup>

Sex-specific mean life expectancy at different ages for both the general population and the Indigenous sub-population of the countries studied is presented in Table 1.<sup>3–7</sup> (Equivalent data for Sámi people, the only recognised Indigenous ethnic group in Europe, was not available.) Notably, older Australians have a greater life expectancy than their peers in Aotearoa New Zealand, who in turn have a greater life expectancy than their

peers in Europe and America. In all countries, the life expectancy of males is less than the life expectancy of females of the same age. Similarly, the life expectancy of the Indigenous sub-population is less than the life expectancy of the general population. The gap between the life expectancy of Aboriginal and Torres Strait Islander people and the general population in Australia is greater than the gap between Māori and the general population in Aotearoa New Zealand, which in turn is greater than the gap between Pacific peoples living in Aotearoa New Zealand and the general

population in Aotearoa New Zealand, which in turn is greater than the gap between American Indian or Alaska Native people and the general population in the United States of America. (It has previously been reported that among residents of northern Scandinavia and the Kola Peninsula, Sámi people are not socially disadvantaged, and their life expectancy is greater than the life expectancy of non-Sámi people.<sup>8)</sup>

Sex-specific age-based recommendations for choice of SAVR versus TAVI for both the general population and the Indigenous sub-population

**Table 1:** Sex-specific mean life expectancy for general and Indigenous populations.

General population								
Country	USA <sup>3</sup>		EU <sup>4†</sup>		NZ <sup>5</sup>		Aust <sup>6</sup>	
Sex	M	F	M	F	M	F	M	F
Age 55	25.8	29.2	26.1	30.3	27.8	30.4	28.5	31.7
Age 60	21.9	24.9	22.0	25.8	23.5	25.9	24.1	27.1
Age 65	18.2	20.8	18.2	21.5	19.3	21.6	20.0	22.7
Age 70	14.7	16.9	14.7	17.4	15.4	17.4	16.1	18.4
Age 75	11.4	13.2	11.5	13.6	11.8	13.5	12.4	14.4
Age 80	8.5	9.9	8.6	10.1	8.6	9.9	9.2	10.7
Age 85	6.0	7.1	6.2	7.2	6.0	6.9	6.4	7.6
Indigenous sub-population								
Country	USA—AI or AN <sup>3</sup>		NZ—Pacific <sup>5</sup>		NZ—Māori <sup>5</sup>		Aust—ATSI <sup>7‡</sup>	
Sex	M	F	M	F	M	F	M	F
Age 55	22.8	26.7	24.1	26.8	23.0	25.3	22.9	24.9
Age 60	19.7	23.0	20.0	22.5	19.2	21.2	19.2	20.9
Age 65	16.7	19.5	16.2	18.5	15.8	17.5	15.8	17.1
Age 70	14.0	16.1	12.8	14.8	12.6	14.0	12.5	13.6
Age 75	11.3	13.0	9.9	11.4	9.8	11.1	9.6	10.3
Age 80	8.8	10.2	7.5	8.5	7.3	8.5	7.1	7.4
Age 85	6.7	7.8	5.5	6.3	5.4	6.4	4.4	4.5

USA = United States of America; EU = European Union; NZ = New Zealand; Aust = Australia; AI or AN = American Indian or Alaska Native; ATSI = Aboriginal and Torres Strait Islanders; M = Male; F = Female. All numbers are in years.

<sup>†</sup>For EU, reported age data for 85 are age cohort data: 85+; <sup>‡</sup>for ATSI, reported age data are age cohort data: 55–59, 60–64, 65–69, 70–74, 75–79, 80–84, 85+.

**Table 2:** Sex-specific age-based recommendations for choice of procedure in the general and Indigenous populations.

General population				
Country	Sex	SAVR	SDM	TAVI
USA <sup>3</sup>	Male	≤62	63–77	≥78
	Female	≤66	67–79	≥80
EU <sup>4</sup>	Male	≤62	63–77	≥78
	Female	≤66	67–80	≥81
NZ <sup>5</sup>	Male	≤64	65–77	≥78
	Female	≤66	67–79	≥80
Aust <sup>6</sup>	Male	≤65	66–78	≥79
	Female	≤68	69–81	≥82
Indigenous sub-population				
Country	Sex	SAVR	SDM	TAVI
USA—AI or AN <sup>3</sup>	Male	≤59	60–77	≥78
	Female	≤64	65–80	≥81
NZ—Pacific <sup>5</sup>	Male	≤59	60–74	≥75
	Female	≤63	64–77	≥78
NZ—Māori <sup>5</sup>	Male	≤58	59–74	≥75
	Female	≤61	62–77	≥78
Aust—ATSI <sup>7†</sup>	Male	≤55	60–70	≥75
	Female	≤60	65–75	≥80

Criteria for recommendations: SAVR—life expectancy >20 years; SDM—life expectancy 10–20 years; TAVI—life expectancy <10 years. USA = United States of America; EU = European Union; NZ = New Zealand; Aust = Australia; AI or AN = American Indian or Alaska Native; ATSI = Aboriginal and Torres Strait Islanders. All numbers are in years.

<sup>†</sup>For ATSI, reported age data age cohort data: 55–59, 60–64, 65–69, 70–74, 75–79, 80–84.

of the countries studied are presented in Table 2.<sup>3–7</sup> The biggest difference between the proposed recommendations and the existing guidelines is in the transition from SAVR to shared decision making (that is, the age from which TAVI is first considered a reasonable option). In the general population, Australian women, for example, should not be considering TAVI as an option until they are in their late 60s. In contrast, in the Indigenous sub-populations, both men and women should be allowed to consider TAVI as an option at much younger ages (until such time as more progress

is made in closing the existing gap in life expectancy).

## Discussion

Neither the Cardiac Society of Australia and New Zealand (CSANZ) nor The Australian & New Zealand Society of Cardiac & Thoracic Surgeons (ANZSCTS) have produced clinical practice guidelines to inform the choice between SAVR and TAVI. This is not unusual. The task of producing clinical practice guidelines has become increasingly

complex and is beyond the resources of professional organisations in smaller countries. Furthermore, the task is somewhat redundant, as the evidence base examined by the major international societies is broadly applicable to all advanced healthcare systems. Nonetheless, applying international guidelines to clinical practice in Australia and Aotearoa New Zealand does require some nuance. The TAVI guidelines<sup>1,2</sup> are a case in point.

The fact that older Australians and Aotearoa New Zealanders enjoy greater life expectancy than Americans and Europeans is not well known. As the gap is greater at age 65 than age 80, this has a greater bearing on the transition point from SAVR to shared decision making than the transition point from shared decision making to TAVI. Patients are understandably keen to be considered suitable for TAVI, but the life expectancy data indicates that Australians and Aotearoa New Zealanders should be more circumspect when assessing the risks associated with the uncertainties of TAVI valve durability.

The fact that women have greater life expectancy than men is generally well known, but the implications of that fact for the choice of SAVR versus TAVI is underappreciated.<sup>9</sup> The life expectancy data presented in this viewpoint clearly indicate that women generally, and Australian women especially, should favour SAVR over TAVI for longer than their male compatriots. This guidance, if adopted, would have implications for the interpretation of sex-based analyses of access to TAVI.

The fact that older Indigenous people suffer worse life expectancy than older non-Indigenous people in the same country is all too familiar. The gap is so wide in Australia that Aboriginal and Torres Strait Islander men should be allowed access to TAVI from age 55, 10 years earlier than the general population. This is in stark contrast to published reports that both Māori and Pacific peoples living in Aotearoa New Zealand<sup>10</sup> and American Indians/Alaskan Natives in North Dakota<sup>11</sup> do not have the same access to TAVI as non-Indigenous people. (The authors are unaware of

any published data on access to TAVI for Aboriginal and Torres Strait Islander people compared to non-Indigenous Australians.)

It is important to appreciate that earlier access to TAVI is particularly relevant to Aboriginal and Torres Strait Islander people in Australia and both Māori and Pacific peoples living in Aotearoa New Zealand. The prevalence of rheumatic heart disease in these groups makes it more likely that they will require aortic valve replacement before the age of 65.<sup>12,13</sup> Notwithstanding the technical challenges associated with TAVI in the setting of rheumatic heart disease,<sup>14</sup> and the lack of head-to-head comparative outcome data for SAVR versus TAVI in Aboriginal and Torres Strait Islander people in Australia and both Māori and Pacific peoples living in Aotearoa New Zealand, the less invasive nature of TAVI is nonetheless inherently preferable. Māori in Aotearoa New Zealand have been shown to have worse outcomes than European people after surgery in general,<sup>15</sup> and cardiovascular surgery in particular,<sup>15</sup> including coronary artery bypass graft surgery specifically,<sup>15,16</sup> but also TAVI.<sup>10</sup> Similar trends have been reported in Pacific peoples living in Aotearoa New Zealand after surgery in general,<sup>15</sup> including after cardiovascular surgery,<sup>15</sup> and Aboriginal and Torres Strait Islander people in Australia after heart valve surgery.<sup>17,18</sup>

To summarise, the age-based recommendations contained in the international TAVI guidelines are based on American and European life expectancy data and so are not directly applicable to Australia and Aotearoa New Zealand. This viewpoint has collated the relevant local data to generate equivalent sex-specific age-based recommendations for Australia and Aotearoa New Zealand. In the general populations, the data favour raising the age from which TAVI is first considered a reasonable option, especially for women. In contrast, and more importantly, among Aboriginal and Torres Strait Islander people in Australia and both Māori and Pacific peoples living in Aotearoa New Zealand, the data favour significantly lowering the age from which TAVI is first considered a reasonable option, for both men and women.

**COMPETING INTERESTS**

None.

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