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## Review

# Ethnic differences of the care pathway following an out-of-hospital cardiac event: A systematic review



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### Abstract

**Aim:** This systematic review aimed to determine to what extent and why the care pathways for acute cardiac events in the community might differ for minoritised ethnic populations compared to non-minoritised populations. It also sought to identify the barriers and enablers that could influence variations in access to care for minoritised populations.

**Methods:** A multi-database search was conducted for articles published between 1 January 2000 and 1 January 2023. A combination of MeSH terms and keywords was used. Inclusion criteria for papers were published in English, adult population, the primary health condition was an acute cardiac event, and the primary outcomes were disaggregated by ethnicity or race. A narrative review of extracted data was performed, and findings were reported according to the PRISMA 2020 guidelines.

**Results:** Of the 3552 articles identified using the search strategy, 40 were deemed eligible for the review. Studies identified a range of variables in the care pathway that differed by ethnicity or race. These could be grouped as time to care, transportation, event related-variables, EMS interactions and symptoms. A meta-analysis was not performed due to heterogeneity across the studies.

**Conclusion:** The extent and reasons for differences in cardiac care pathways are considerable. There are several remediable barriers and enablers that require attention to achieve equitable access to care for minoritised populations.

**Keywords:** Out of Hospital Cardiac Arrest, Systematic review, Emergency medical services

## Introduction

Reducing the burden of cardiovascular disease (CVD) is a worldwide priority requiring reduced exposure to the risk factors for disease and equitable access to care.<sup>1,2</sup> The global prevalence of CVD rose from 271 million in 1990 to 550 million in 2019, mirrored by rising CVD mortality rates and a doubling of years of healthy life lost to disease from 17.7 million to over 34 million.<sup>3</sup> Particularly concerning are disparities between and within nations, with low and middle-income countries having smaller reductions over time in the burden of CVD than high-income countries.<sup>4</sup> Within countries, there are widespread health inequities for Indigenous and other minoritised ethnic

populations<sup>5,6</sup> that continue despite technological and clinical advancements in CVD treatment and care.

Access to pre-hospital care following an out-of-hospital cardiac event (OHCE) requires particular attention. On average, only 10 % of people who suffer a cardiac arrest in the community survive to hospital discharge.<sup>7</sup> Chances of survival are markedly increased with access to cardiopulmonary resuscitation (CPR) and defibrillation.<sup>8–10</sup>

For an ST elevated myocardial infarction (STEMI), every 10-minute delay to reperfusion is associated with a 3.3 % increased risk of death, and every 30-minute delay is associated with a 7.5 % increased risk.<sup>11</sup> Across the spectrum of care for cardiac events in the community, minoritised populations experience differential access.<sup>12,23</sup> Ensuring timely access to care requires understanding

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the mechanisms affecting a patient's journey to care from the onset of symptoms until arrival at the hospital. While previous systematic reviews have described access to care for individual cardiac conditions, such as acute coronary syndromes or cardiac arrest, this review takes a holistic approach to identify the extent of disparities in access to care in the community for any OHCE. Furthermore, the review aims to identify the barriers and enablers to care in the community for minoritised populations following an OHCE from the symptom onset to receipt of care from a registered health professional. It has been undertaken as part of Manawataki Fatu Fatu for Achieving Cardiovascular Care for Equity Studies (ACCESS),<sup>13</sup> a research programme focusing on the heart health of Māori, the indigenous people of New Zealand, and Pacific peoples. Research relating to indigenous people has been prioritised in this review.

## Methods

This review followed the PRISMA 2020 guidelines.<sup>14</sup> The full protocol for this review was published<sup>15</sup> and registered with PRSOPERO (CRD42022279082). The search strategy was developed in collaboration with the research team and research librarians at the University of Auckland. Searches were performed in CINAHL, EMBASE, MEDLINE (OVID), Pubmed, Scopus, Google Scholar, and Cochrane library for articles published between 01 January 2000 and 01 January 2023.

We used a broad definition of non-traumatic cardiac events, including chest pain, arrhythmia, myocardial infarction, and cardiac arrest.

### Inclusion/exclusion criteria

To be eligible for inclusion, studies had to have primary analyses comparing non-traumatic cardiac events in the pre-hospital setting

among adults, by ethnicity or race. The full text of each study had to be available, published in English and in peer-reviewed journals. Articles were excluded where ethnicity or race was not well defined or was inferred using neighbourhood or language. The only exclusion by study type were other systematic reviews.

### Study Selection, appraisal, and synthesis

Screening and critical appraisal were done by multiple authors. Identified, included, and excluded articles are reported according to PRISMA 2020 guidelines (Fig. 1). The Mixed Methods Appraisal Tool (MMAT)<sup>16</sup> was used to critically appraise all articles. Papers that included indigenous populations were additionally examined using the CONSIDER statement.<sup>17</sup> Risk of bias for quantitative studies was assessed using the Graphic Appraisal Tool for Epidemiology.<sup>18</sup>

Data were extracted independently by multiple authors into a standardised form. The variables extracted included study and patient characteristics and outcomes. Outcomes included (but were not limited to): time, journey, barriers, enablers, and witnessed status. Data synthesis was underpinned by indigenous data sovereignty approaches<sup>19,20</sup> and a convergent integrated approach was used in the synthesis with quantitative findings themed before conversion to narratives.<sup>21</sup>

## Results

### Study characteristics

Forty studies published between 2000 and 2022 met review eligibility criteria (Table 1). Most (29 articles) of the research was conducted in the United States of America, the remaining studies came from Aotearoa New Zealand (four), England and United Kingdom (four), and Canada, Australia and Brazil (one each). Study designs included two qualitative studies and 38 quantitative studies. A meta-analysis

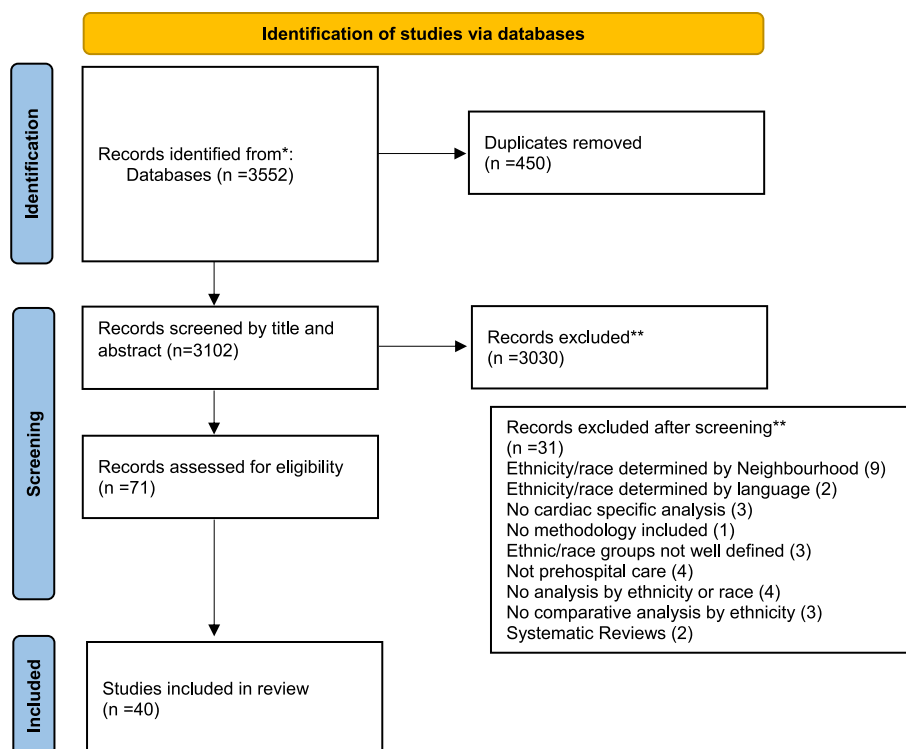


Fig. 1 – Flow chart of the selection process.

**Table 1 – Study characteristics.**

Author, Year	Total number of participants: by Ethnicity/Race	Country	Design	CONSIDER statement for studies with indigenous participants	Out of hospital cardiac event
Finnegan, Meischke, Zapka, Leviton, Meshack, Benjamin-Garner, Estabrook, Hall, Schaeffer, Smith, Weitzman, Raczynski, & Stone, 2000 <sup>22</sup>	Focus groups: White 10, African American 4, Latino 3	United States	Qualitative	Not applicable	Chest Pain, Other
Lee, Bahler, Chung, Alonzo, & Zeller, 2000 <sup>23</sup>	128: Black 41, white 87	United States	Qualitative	Not applicable	Myocardial Infarction
Sheifer, Rathore, Gersh, Weinfurt, Oetgen, Breall, & Schulman, 2000 <sup>24</sup>	72221: White 93026, Black unspecified, Other unspecified,	United States	Quantitative	Not applicable	Myocardial Infarction, Chest Pain
Gibler, Armstrong, Ohman, Weaver, Stebbins, Gore, Newby, Califf, & Topol, 2002 <sup>25</sup>	Cohort 1: 23105: White 20962, Black 1113, Other 962. Cohort 2 4744: White 4108, Black 222, Other 199	United States	Quantitative	Not applicable	STEMI
Adamson, Ben-Shlomo, Chaturvedi, & Donovan, 2003 <sup>26</sup>	1350: Black 191, White 1146	England	Quantitative	Not applicable	Chest Pain
McGinn, Rosamond, Goff Taylor, Miles, & Chambless, 2005 <sup>27</sup>	18928: Black 3807, White 15,119	United States	Quantitative	Not applicable	Myocardial Infarction
Barnett, Reader, Ward, & Casper, 2006 <sup>28</sup>	242406: White/non-Hispanic 175,309, Black/non-Hispanic 48571, Hispanic 13043, Asian/non-Hispanic 3888, American Indian/Alaska Natives/non-Hispanic 1595	United States	Quantitative	Not applicable	Cardiac Arrest
Dubard, Garrett, Gizlice, 2006 <sup>29</sup>	25,423: Non-Hispanic white 21354, non-Hispanic black 2847, English speaking Hispanic 695, Spanish speaking Hispanic 527	United States	Quantitative	Not applicable	Myocardial Infarction
Ratner, Tzianetas, A Tu, Johnson, Mackay, Buller, Rowlands, & Reime, 2006 <sup>30</sup>	976: Born in Canada 540, Not born in Canada (not Chinese/South Asian) 221, South Asian (not born in Canada) 67, Chinese (not born in Canada) 148	Canada	Quantitative	Not applicable	Myocardial Infarction, Chest Pain
Fairbanks, Shah, Lerner, Ilangovan, Pennington, & Schneider, 2007 <sup>31</sup>	539: White 274, Black 190, Other 28, Unknown 47	United States	Quantitative	Not applicable	Cardiac Arrest
McSweeney, Lefler, Fischer, Naylor, & Evans, 2007 <sup>32</sup>	1009: Black 509, White 500	United States	Quantitative	Not applicable	Myocardial Infarction
Vadeboncoeur, Richman, Darkoh, Chikani, Clark, & Bobrow, 2007 <sup>33</sup>	1379: non-Hispanic 1106, Hispanic 273	United States	Quantitative	Not applicable	Cardiac Arrest
Ben-Shlomo, Naqvi, & Baker, 2008 <sup>34</sup>	150330: Caucasian 118323, Asian 5486	England & Wales	Quantitative	Not applicable	Myocardial Infarction, STEMI, non-STEMI, Chest Pain
Lutfiyya, Lipsky, Bales, Pharm, & McGrath, 2008 <sup>35</sup>	14,763,465: Caucasian 12890086, African American 1,873,379	United States	Quantitative	Not applicable	Other, Myocardial Infarction
McGruder, Greenlund, Malarcher, Antoine, Croft, & Zheng, 2008 <sup>36</sup>	33059: Black/non-Hispanic 4573, Hispanic 5568, White/non-Hispanic 21,727	United States	Quantitative	Not applicable	Chest Pain
Ting, Bradley, Wang, Lichtman, Nallamothu, Sullivan, Gersh, Roger, Curtis, & Krumholz, 2008 <sup>36</sup>	482327: White 415912, Black 24646, Hispanic 13972, Asian 6978, Other/Unknown 20,819	United States	Quantitative	Not applicable	STEMI
David & Harrington, 2010 <sup>37</sup>	120000: African Americans unspecified, Whites unspecified	United States	Quantitative	Not applicable	Chest Pain, Cardiac Arrest

(continued on next page)

**Table 1 (continued)**

Author, Year	Total number of participants: by Ethnicity/Race	Country	Design	CONSIDER statement for studies with indigenous participants	Out of hospital cardiac event
Fang, Gillespie, Keenan, & Greenlund, 2011 <sup>38</sup>	76,864: non-Hispanic white 60412, non-Hispanic Black 10172, Hispanic 2593, Other 3687	United States	Quantitative	Not applicable	Myocardial Infarction
Wilde, Robbins, & Pressley, 2011 <sup>39</sup>	3869: White 3516, Black 353	United States	Quantitative	Not applicable	Cardiac Arrest
Garofalo, Grey, Lee, Exeter, & Kerr, 2012 <sup>40</sup>	805: European 386, Māori 94, Pacific 141, Indian 102, Other 43	New Zealand	Quantitative	Not applicable	Myocardial Infarction, STEMI, non-STEMI
Sasson, Magid, Chan, Root, McNally, Kellermann, & Haukoos, 2012 <sup>41</sup>	5464: White, 3950 Black, 857 Hispanic, 364 Other	United States	Quantitative	Not applicable	Cardiac Arrest
Kendall, Marley, Patel, Khan, Blann, Lip, & Dwivedi, 2013 <sup>42</sup>	672: White 516, South Asian 156	United Kingdom	Quantitative	Not applicable	Myocardial Infarction
Bansal, Dhawan, Wagman, Low, Zheng, Chan, Newton, Swadron, Testa, & Shavelle, 2014 <sup>43</sup>	115: White 15, African American 10, Asian 14, Latino 71, Other 5	United States	Quantitative	Not applicable	STEMI
Asghar, Phung, & Siriwardena, 2016 <sup>44</sup>	4825: White 4661, non-White 164	England	Quantitative	Not applicable	Chest Pain
Bolorunduro, Smith, Chumpia, Valasareddy, Heckle, Khouzam, Reed, & Ibebuogu, 2016 <sup>45</sup>	1144: White 463, Black 644, Others 37	United States	Quantitative	Not applicable	STEMI
Zegre-Hemsey, Pickham, & Pelter, 2016 <sup>46</sup>	1299: White 607, American Indian 115, Black 284, Asian 287, Pacific Islander 6	United States	Quantitative	No	Myocardial Infarction
Miller, Simon, Roe, Kontos, Diercks, Amsterdam, & Bhatt, 2017 <sup>47</sup>	346499: White 307624, Black 388,875	United States	Quantitative	Not applicable	Myocardial Infarction, STEMI, non-STEMI
Rodrigues, Melleu, Schmidt, Gottschall, Pereira de Moraes, & Quadros, 2018 <sup>48</sup>	1297: White unspecified, Black unspecified	Brazil	Quantitative	Not applicable	STEMI
Becker, Gul, Cohen, Maciel, Baron-Lee, Murphy, Youn, Tyndall, Gibbons, Hart, & Alviar, 2019 <sup>49</sup>	578 White 346, Black 89, Asian 100, Other 43. Separate ethnicity category 553 Hispanic 109, non-Hispanic 444	United States	Quantitative	Not applicable	Other
Dicker, Todd, Tunnage, Swain, Conaglen, Smith, Brett, Laufale, & Howie, 2019 <sup>50</sup>	9995: Māori 2058, Pacific Islanders 766, European/other 6495	New Zealand	Quantitative	No	Cardiac Arrest
Dicker, Todd, Tunnage, Swain, Smith, & Howie, 2019 <sup>51</sup>	1639: Maori 240, Pacific Islanders 58, European/other 1341	New Zealand	Quantitative	No	Cardiac Arrest
Kerr, Lee, Grey, Pegg, Fisher, White, Nunn, Williams, Smyth, Scott, Chen, Zhao, Tun, Harwood, & Devlin, 2019 <sup>52</sup>	3857: Māori 396, Pacific Islander 148, Indian 207, Other Asian 150, NZ European/Other 2956	New Zealand	Quantitative	No	STEMI
Lewis, Zeger, Li, Mann, Newgard, Haynes, Wood, Dai, Simon, & McCarthy, 2019 <sup>53</sup>	2387523: White 1511302, Black 372453, Other 114601, Unknown 389166. Separate category: Hispanic 83,563	United States	Quantitative	Not applicable	Cardiac Arrest, Chest Pain, Myocardial Infarction
Mahajan, Valero-Elizondo, Khera, Desai, Blankstein, Blaha, Virani, Kash, Zoghbi, Krumholz, & Nasir, 2019 <sup>54</sup>	25271: non-Hispanic white 17910, non-Hispanic black 2782, Hispanic 3010	United States	Quantitative	Not applicable	Chest Pain, Myocardial Infarction
Nasir, Mahajan, Valero-Elizondo, Khera, Desai, Blankstein, Blaha, Virani, Kash, Zoghbi, Krumholz, & Nasir, 2019 <sup>55</sup>	25271: Non Hispanic White 17910, Non Hispanic Black 2782, Hispanic 3010	United States	Quantitative	Not applicable	Myocardial Infarction
Lai, Lancet, Weiden, Webber, Zeig-Owens, Hall, & Prezant, 2020 <sup>56</sup>	Comparison 1161: White 382, Asian 88, Black 332, Hispanic 239, Mixed 120. Covid 2992: White 611, Asian 218, Black 1025, Hispanic 763, Mixed 375.	United States	Quantitative	Not applicable	Cardiac Arrest

Table 1 (continued)

Author, Year	Total number of participants: by Ethnicity/Race	Country	Design	CONSIDER statement for studies with indigenous participants	Out of hospital cardiac event
Moeller, Kragholm, Dupre, Sasson, Pearson, Tyson, Jollis, Monk, Starks, McNally, Thomas, Becker, Torp-Pedersen, & Granger, 2021 <sup>57</sup>	7091: Black 2591, White 4500	United States	Quantitative	Not applicable	Cardiac Arrest
Dawson, Andrew, Nehme, Bloom, Okyere, Cox, Anderson, Stephenson, Lefkovits, Taylor, Kaye, Smith, & Stub, 2022 <sup>58</sup>	257017: Aboriginal & Torres Strait Islander 3719, non-Aboriginal/Torres Strait Islander 207,966	Australia	Quantitative	No	Chest Pain
Garcia, Spertus, Girotra, Nallamotheu, Kennedy, & McNally, 2022 <sup>59</sup>	110054: Black 27205, Hispanic 8264, White 74,585	United States	Quantitative	Not applicable	Cardiac Arrest
Taylor, Stickney, French, Jollis, Kontos, Niemann, Sanko, Eckstein & Bosson, 2022 <sup>60</sup>	586: White 255, Black 95, Hispanic 116, Asian 28, Pacific Islanders 3, Unspecified 89	United States	Quantitative	No	STEMI

of the quantitative studies was not conducted because of the heterogeneity of interventions and the stratification of participants by race or ethnicity. Of the six studies that included indigenous peoples as participants, none met the reporting criteria in the CONSIDER statement.

### Results of individual studies

A synthesis of study findings is provided across five themes that capture a variety of influences on the care pathway: time to care, transportation, event related-variables, EMS interactions and symptoms. Most studies reported findings related to transportation (13articles) and time to care (14articles). Race and ethnicity are reported according to the terminology used in each study.

### Time to care

Nine studies identified varying levels of racial or ethnic differences in the length of time it took to receive care after an OHCE within the community or upon arrival at hospital. African Americans were more likely to experience delays in receiving care following an OHCE than white Americans.<sup>22–26</sup> Similarly, Māori and Indian ethnic groups experienced longer delays in care than other ethnic groups in New Zealand.<sup>27</sup> Factors that were associated with delays to treatment included co-morbidities (in particular diabetes and hypertension),<sup>23,25,28,29</sup> insurance status<sup>24</sup> and socio-economic variables.<sup>30</sup>

While variations by gender within racial and ethnic groups were not often studied, female gender was generally associated with longer delays to care. Black women who attributed their symptoms as an acute myocardial infarction (AMI) were three times more likely to receive care within two hours than other Black women in the study; however, this was still four times less than White women.<sup>31</sup>

### Transportation

Three studies identified ethnic differences in mode of transport, with Latino,<sup>32</sup> Māori, Pacific peoples, Indians<sup>27</sup> and South Asians<sup>33</sup> less likely to be transported to the hospital by ambulance than non-minoritised populations. Conversely, being white, female, aged over 65 and having a history of stroke or diabetes was associated with a higher use of ambulance services.<sup>25</sup> Ashgar, Phung, & Siriwardena (2016) found that ambulance services were proportionately more likely to attend callouts to White patients than non-White patients.<sup>34</sup>

Three studies reported the time taken for EMS to arrive on the scene by ethnicity. All these studies were based in the United States but in different settings. David & Harrington (2010) identified that EMS arrived on the scene faster for African American patients compared with white patients although this difference was non-significant once population density was controlled for.<sup>35</sup> In Rochester, New York, there were no differences in the call response times following a cardiac arrest for African Americans and Whites.<sup>36</sup> In Illinois, the average response time from call pick up to the scene for cardiac arrest was longer for Whites than African Americans. However, this finding did not include the time from symptom onset to EMS call and there may be additional differences by race between these variables that are unaccounted for.<sup>37</sup>

Two studies identified differences in the EMS service destinations, by the ethnicity of the patients experiencing an OHCE. In New Zealand, Māori were less likely to be taken to a hospital capable of performing percutaneous coronary intervention (PCI) after a myocardial infarction,<sup>38</sup> and in the East Midland, non-White patients with suspected cardiac pain were less likely to be taken to hospital.<sup>34</sup>

### Event related variables

One article identified differences in whether or not a cardiac event was witnessed between ethnic groups in New Zealand. A lower proportion of bystanders witnessed cardiac arrests in Māori people than in Pacific people. Māori and Pacific people were also less likely to have a cardiac arrest witnessed by EMS than New Zealand Europeans.<sup>39</sup>

Timely access to cardiopulmonary resuscitation (CPR) and defibrillation improves the likelihood of surviving an OHCE. Eight articles identified ethnic differences in access to CPR and defibrillation. African American and Hispanic patients<sup>40,41</sup> were less likely to receive bystander CPR following an OHCE, although the rates of bystander CPR for African American patients have increased over time.<sup>42</sup> Conversely, being male, white and having a cardiac arrest in public, increased the likelihood of receiving bystander CPR.<sup>43</sup> In a study measuring the likelihood of performing CPR, white bystanders reported being less likely to initiate CPR if the patient was an adolescent female. The barriers to performing CPR were identified as lack of training, concern for exposing patients' breasts and causing further injury to patients.<sup>44</sup> Furthermore, Māori in New Zealand received lower rates of defibrillation in the community compared with European/others.<sup>39</sup>

### EMS interactions

Wilde, Robbins, & Presley (2011) found that Black patients were more likely to experience a cardiac arrest in a non-hospital health facility, have a call made to EMS by a member of the public following onset of symptoms, and were less likely to receive EMS defibrillation.<sup>37</sup> African American patients also perceived EMS quality as being low, and this perception was associated with a delay in seeking care once symptoms were identified.<sup>45</sup>

### Symptoms

Six of the 12 articles investigating how the experience of symptoms affected patient interactions with health care providers identified significant ethnic differences. Symptom awareness was higher among non-Hispanic white people than other racial groups or ethnicities.<sup>46,47</sup> Hispanic and African American populations were less likely to recognise symptoms,<sup>48–50</sup> were more likely not to know any symptoms of an AMI<sup>32</sup> or were less likely to have all the recommended knowledge of symptoms.<sup>46</sup> African American women were also less likely to attribute symptoms to AMI.<sup>31</sup>

Four articles identified ethnic differences in symptom characteristics. Among African American and White patients, the experience of chest pain was similar; however White patients experienced pain in the shoulder, neck, and jaw more frequently than African Americans. African Americans were more likely to experience dyspnoea and fatigue.<sup>22</sup> Black race was also associated with atypical presentation following a STEMI.<sup>51</sup> Compared with other women, Hispanic women were more likely to describe their pain as burning or cramping.<sup>45</sup>

How patients responded to the experience of symptoms differed by ethnicity or race. Hispanics and African American men were less likely to call for EMS in response to common symptoms of heart attack or other OHCE.<sup>48,49,52</sup> In Australia, Aboriginal and Torres Strait Islander people had higher rates of calling an ambulance for chest pain.<sup>53</sup> It should also be noted that whilst recognising symptoms early is associated with a shorter delay to receiving care, there were lower rates of wanting to call EMS in some populations.<sup>34</sup>

## Discussion

This systematic review reveals that there are important ethnic differences in the experience of the OHCE care pathway. The differences operate across diverse contexts and settings, characterised by longer times to receive care, differential access to care from both health professionals and bystanders, as well as an unmet need for health education evident in the variation in symptom recognition. Collectively, these themes speak to a range of barriers faced by minoritised ethnic populations to accessing timely, appropriate, acute pre-hospital cardiac care.

To our knowledge, this is the first review to take a global perspective with a focus on Indigenous people. Despite their diversity, Indigenous and other minoritised ethnic populations often have a shared history of discrimination and structural disadvantage<sup>54</sup> that underpin the health inequities they experience. A global approach can inform the research gap in settings where the pre-hospital acute cardiac care evidence base is still emerging. In taking this approach our review has highlighted that indigenous representation within the studies identified was either limited or did not meet the criteria of the CONSIDER statement. Achieving health equity for indigenous and other minoritised ethnic populations requires access to high quality data that supports the health aspirations of those communities. Cardiac registries, for example, are an integral part of the research data landscape and are widely used in system-level monitoring and quality improvement.<sup>55</sup> However, there are significant gaps in clinical registry data, such as accurately capturing ethnicity information for indigenous peoples,<sup>56</sup> that limits the effectiveness of said data.

Across the pre-hospital care pathway, racial and ethnic barriers to timely care exist.<sup>57</sup> A number of reasons why the barriers exist were identified in this review including co-morbidities, insurance status, and socioeconomic variables. Barriers to CPR were identified as concern for causing injury or exposing patients. At the patient level, acute cardiac symptom recognition<sup>58,59</sup> ambulance activation, as well as the provision of bystander CPR and community AED<sup>60–62</sup> are important initial steps for care of a cardiac event in the community. All require recognising symptoms and responding to the need for care by calling EMS and initiating CPR or AED if needed. However, recognition and response to a critical health issue is affected by important social and emotional contexts that need to be better understood.<sup>63</sup> Health systems often default to health literacy interventions that in isolation have limited effect on long-term behaviour change among disadvantaged communities<sup>64</sup> Therefore, increasing knowledge of these skills without addressing the broader context it occurs within will have a limited impact on shortening pre-hospital delay. Moreover, for indigenous communities, policies to address inequities that are focused on behaviour change rather than targeting the underlying power imbalances maintain those inequities brought about by colonisation.<sup>65</sup> Research identifying some of the reasons for the barriers has been undertaken. Sasson et al. (2015) for example report a distrust of the law, financial concerns, immigration status, lack of recognition of the event, language barriers, and violence as discouraging the use of EMS<sup>66</sup> in Latino neighbourhoods. Concern for personal safety, fear of legal repercussions, and lack of social cohesion were barriers to performing CPR.<sup>67</sup> Geographic level analyses indicate differences in bystander CPR or receipt of automated external defibrillation depending on the ethnic or racial majority of a neighbourhood.<sup>68,69</sup> Addressing spatial access

to community AED is remedied through increasing the availability and visibility of AED in areas of need. Increasing bystander intervention however, is more complex. Implicit biases among health professionals is known to affect patient care<sup>70</sup> it may also affect bystander response.

Gender variances within racial and ethnic groups were less frequently identified, but a pattern emerged suggesting that female gender is associated with longer delays to care. Previous research has identified gender differences in the type and quality of care received. Lewis et al. (2019) identified that women (un-differentiated by ethnicity or race) were less likely to receive the recommended treatments for chest pain or be resuscitated after an out of hospital cardiac arrest.<sup>71</sup> In New Zealand, the characteristics of out-of-hospital cardiac arrest for women in the general population differed from men, with women more likely to be older, experience an arrest at home and have an unwitnessed event.<sup>72</sup> The intersection between gender ethnicity, and clinical presentation needs to be better understood to ensure that women's health needs are appropriately addressed.<sup>73</sup>

The findings of this review highlight the importance of taking a systems approach to targeting disparities in the early activation of care and the need to identify and address structural barriers faced by minoritised communities. This must be underpinned by robust, equity centred evidence specific to each population. Most studies included in this review focused on identifying or quantifying gaps and disparities, but very few captured patients' voices and only two included a qualitative component. So while there is research measuring and describing differences in access, the quantitative approaches used do not always capture the "the complex, layered, and multifaceted social, economic, and political factors that shape health disparities."<sup>74</sup> More qualitative research would provide nuanced information to inform context- and population specific interventions.

Overall, the findings highlight the existence of ethnic disparities in time to care following an OHCE. These disparities were attributed to various factors, including comorbidities, insurance status, socioeconomic variables and transportation barriers. It is essential to address these disparities through targeted interventions aimed at improving access to timely care for all populations. By addressing these issues, health care systems can work towards reducing inequities in the provision of emergency care and improving outcomes for individuals experiencing out-of-hospital cardiac events.

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## Strengths and limitations

One of the strengths is the use of indigenous methodologies to underpin the review. In particular, the use of the CONSIDER statement within the critical appraisal process, ensured an indigenous centric lens was applied to articles reporting on indigenous populations. The statement, published in 2019 consolidates national and international guidelines to ensure that research involving indigenous participants meet the health equity priorities of indigenous peoples.<sup>17</sup> It is to be expected that studies published prior to the publication of the statement would not adhere to all guidelines. However, it is vital that future research with, by, and for indigenous communities is aligned to the statement if health equity for indigenous peoples worldwide is to be achieved.

There were limitations that affect this review. Only articles published in English were included and analyses were limited by the

way ethnicity and race were reported across the identified literature. Articles from the United States were more likely to use race to describe the different populations of interest, whereas studies from the United Kingdom, New Zealand and Australia were more likely to use ethnicity. Where race was used, there was no consistency in the categories used to describe populations, thus limiting the ability to describe any differences or similarities across studies by race and or ethnicity. In some of the studies, ethnicity or race was coded by the EMS provider, rather than self-defined, so ethnicity may be under-reported or incorrectly assigned.

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## Conclusion

The published literature demonstrates important differences between minoritised and non-minoritised ethnic populations in the care pathway following out of hospital cardiac events. There is a critical need to understand and address the mechanisms that drive these differences to achieve equitable CVD care.

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## Relationships

There are no relationships to disclose.

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## Patents and intellectual property

There are not patents or intellectual property to disclose.

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## Additional activities

There are no additional activities to disclose.

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## CRedit authorship contribution statement

**Rochelle Newport:** Conceptualization, Data curation, Formal analysis, Writing - original draft. **Corina Grey:** Formal analysis, Supervision, Writing - review & editing. **Bridget Dicker:** Formal analysis, Supervision, Writing - review & editing. **Shanthi Ameratunga:** Formal analysis, Writing - review & editing. **Matire Harwood:** Formal analysis, Supervision, Writing - review & editing.

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## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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