Review Article

Global prevalence of cardiopulmonary resuscitation training among the general public: a scoping review

Alexei Birkun[1], Adhish Gautam[2], Fatima Trunkwala[3]

[1]Department of General Surgery, Anesthesiology, Resuscitation and Emergency Medicine, Medical Academy named after S. I. Georgievsky of V. I. Vernadsky Crimean Federal University, Simferopol, Russia
[2]Department of Emergency, Government Multispeciality Hospital Sector-16, Chandigarh, India
[3]Department of Cardiology, George Eliot Hospital NHS Trust, Nuneaton, United Kingdom

A scoping review was conducted to identify, map, and analyze international evidence from studies investigating the prevalence of community cardiopulmonary resuscitation (CPR) training. We searched major bibliographic databases and grey literature for original studies evaluating the prevalence of CPR training in the general population. Studies published from January 2000 to October 2020 were included without language or publication type restrictions. Seventy-three eligible papers reported a total of 61 population-based surveys conducted in 29 countries. More than three-fourths of the surveys were conducted in countries with high-income economies, and none in low-income countries. Over half of the surveys were at a subnational level. Globally, the proportion of laypeople trained in CPR varied greatly (median, 40%). For high-income countries, the median percentage was twice as high as that of upper middle-income countries (50% vs. 23%). The studies used heterogeneous survey methods and reporting patterns. Key methodological aspects were frequently not described. In summary, few studies have assessed CPR training prevalence among the general public. The rates of resuscitation training for the vast majority of countries remain unknown. High heterogeneity of studies precludes a reliable interpretation of the research. International Utstein-style consensus guidelines are needed to inform future research and reporting of public resuscitation training worldwide.

Keywords Cardiopulmonary resuscitation; Surveys and questionnaires; Education; Population surveillance; Heart arrest

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Capsule Summary

What is already known
Surveys of the general public help to determine prevalence rates of cardiopulmonary resuscitation (CPR) training, laypersons' perceptions and barriers for resuscitation education, therefore, bringing relevant information for developing and guiding CPR training programs and campaigns. While a number of observational studies have been carried out worldwide to investigate prevalence of CPR training among the general public, no research has been done yet to identify, map and analyze the available evidence.

What is new in the current study
This scoping review represents an attempt to uncover the international evidence from the population-based surveys investigating the prevalence of CPR training among the general public over the last 20 years. The review reveals occurrence and geographic distribution of the studies, clarifies the design and conduct of the research, identifies knowledge gaps, and may inform future systematic reviews on the topic.

INTRODUCTION

Out-of-hospital cardiac arrest (OHCA) is a major public health problem with global levels of survival below 10% to date.[1] Evidence suggests that survival is more likely among OHCA victims who receive cardiopulmonary resuscitation (CPR) from laypeople.[1,2] However, rates of CPR by laypeople remain poor in many countries.[3,4]

Lack of sufficient knowledge and skills is known to be one of the predominant reasons that impede laypeople's readiness to attempt resuscitation.[5,6] It is recognized internationally that effective training of laypeople in CPR is essential to increase the number of people willing and able to provide help in a real-life emergency and to improve survival after OHCA.[7] In order to prioritize and inform training interventions in a community, it is important to understand existing practices of CPR education.

Surveys of the general public help to determine the prevalence rates of CPR training, laypeople's perceptions, and the barriers for resuscitation education. These provide relevant information for developing and guiding CPR training programs and campaigns.[8,9] Without this knowledge, it is difficult to make reasonable improvements to promote CPR by laypeople. While a number of observational studies have been carried out worldwide to investigate the prevalence of CPR training among the general public, no research has been done yet to identify, map, and analyze the available evidence.

We conducted a global scoping review of studies reporting the prevalence of CPR training in the general population that was published in the last 20 years. The factors associated with being trained in CPR, willingness to be trained, most common sources of such training, and barriers for CPR training were also reviewed.

METHODS

This scoping review was performed in accordance with the PRISMA-ScR (Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews).[10] The protocol for this review was not preregistered.

Eligibility criteria

All original studies were considered to be eligible for inclusion if they met the following criteria: (1) reporting prevalence of CPR training (percentage of people ever being trained in CPR) within a sample drawn from the general population in a particular geographic area and (2) published between January 2000 and mid-October 2020. There were no restrictions for publication type or language.

We excluded studies: (1) reporting prevalence of CPR training for selected categories of the public (rather than the general public), e.g., for particular occupations (medical practitioners, teachers, students, etc.), participants of training events, patients or visitors to medical facilities, specific age groups (e.g., youth, elderly); (2) where a target population, number of participants or study geography were not defined clearly; and (3) reporting prevalence of first aid training in general without specifying rates of CPR training. Studies reporting relevant data for the general public excluding people with medical background were considered to be eligible.

Information sources and search strategy

We systematically searched Embase, Medline, Scopus, Web of Science, and relevant grey literature (Google Scholar). A search strategy is shown in Supplementary Table 1. Considering the limited functionality of the advanced search in Google Scholar, we used a simplified search request (resuscitation AND training AND survey) and analyzed 1,000 references which we ranked in relevance. Reference lists of included publications were also manually searched for eligible studies.

Study selection and data collection

Three researchers were responsible for the study selection and data collection process. Two of them screened and extracted the data. In cases of disagreement, a third opinion was sought to achieve consensus.

Titles, abstracts, and keywords of all identified studies were screened, and records of potentially eligible papers were collected using Zotero reference management software. After removing duplicates, the full texts of all potentially eligible papers were obtained and reviewed for eligibility. For non-English papers, the eligibility assessment and data extraction were limited to the contents of English-language abstracts and tables.

The following data were extracted from eligible publications using a predesigned and pilot-tested table: (1) characteristics of the study and participants (including year, country, and geographic coverage of the survey, method of survey administration, method of sampling, number, and age of participants, sample size justification [yes/no], response rate); (2) prevalence of CPR training (percentage of ever trained and percentages of trained within previous 1 year, 2 years, 5 years, or over 5 years out of ever trained); (3) percentage of those willing to be trained in CPR; (4) respondents' characteristics confirmed to be associated with being trained in CPR; (5) sources of CPR training (with percentage of participants reporting a source); and (6) reasons for not being trained in CPR (with percentage of participants reporting a rea-

son). Considering the high between-study variability in the number and kind of reported sources of training and the reasons for not being trained, data on the three commonest sources/reasons were collected.

In cases where relevant data in percentages (e.g., prevalence of CPR training or response rate) were not reported in a paper, but corresponding numerical data were available, the respective percentage values were calculated by the researchers. Where prevalence rates of CPR training by the timing of last training (e.g., within last year) were presented in publications as calculated out of all survey respondents, respective values were recounted to percentages out of persons ever trained in CPR for conformity. Where a paper reported two or more surveys conducted in distinct study periods or in different countries, the surveys were considered as stand-alone studies. In cases where both a conference abstract and a journal article described the same study, and where discrepancies in data were found between the publications, the data from the journal article were considered to be preferential. Where discrepancies were found between the two articles, the data from the latest paper were considered preferential.

Quality assessment

To maximize the scope, this review examined all types of publications, including conference abstracts, where methods were not described in detail. The broad inclusion criteria, as well as the large heterogeneity of the included studies, prevented us from performing a formal quality assessment. However, the relevant characteristics of the methodological quality of the studies (primarily as concerns completeness of the description of the methods in journal articles), were considered and analyzed.

Data synthesis

Significant heterogeneity in the research designs and data prevented a meta-analysis, and the results are described in a narrative synthesis.

RESULTS

After excluding irrelevant records and duplicates 118 full texts were retrieved and assessed for eligibility (Fig. 1). The final analysis included 73 papers: 53 articles, 18 conference abstracts, one short communication, and one dissertation abstract. Out of nine potentially eligible non-English papers, four articles were included (one Icelandic and three Korean).

Characteristics of the studies

Eligible papers described a total of 61 studies (cross-sectional population-based surveys) conducted between 1997 and 2019,
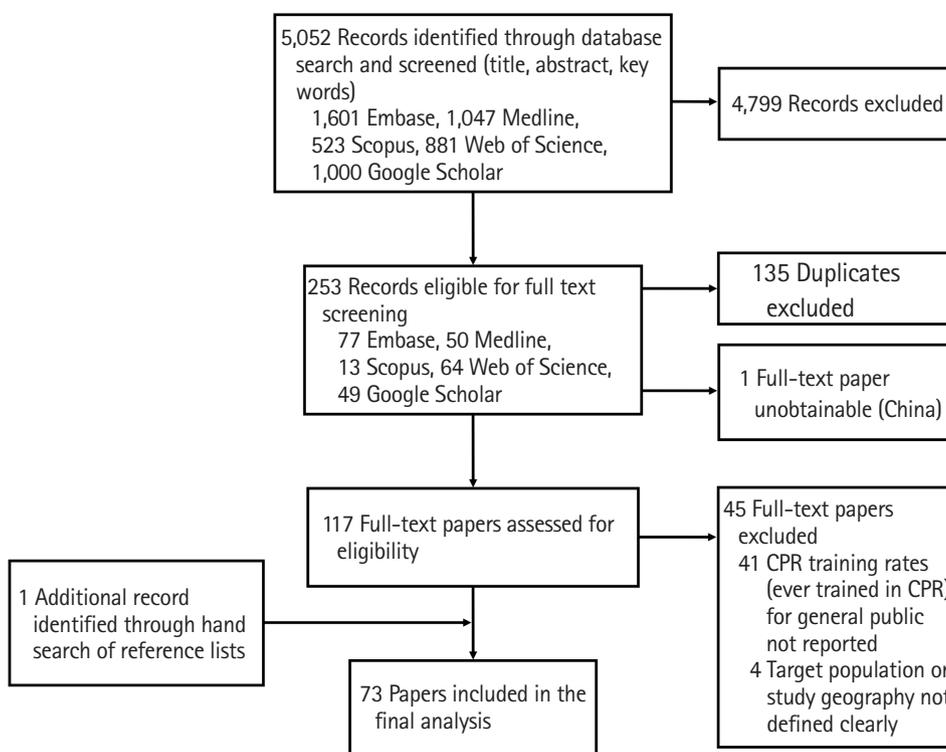

Fig. 1. Flow diagram of the publication selection process. CPR, cardiopulmonary resuscitation.

reporting data on the prevalence of CPR training among the general public in 29 countries. The details of the included studies are provided in Supplementary Table 2. One paper presented the results of surveys conducted in two countries (China and India),[11] while other papers described single-country surveys.

The distribution of the studies by global regions, subregions, and countries is shown in Fig. 2. The countries represent 14.1% of the 206 world's sovereign states and 14.5% of the 193 member states of the United Nations.[12] According to the World Bank's economic classification,[13] the surveys involved populations of 25.3% (21/83) countries with high-income economies, 10.7% (6/56) countries with upper middle-income economies (Brazil, China, Costa Rica, Indonesia, Russia, and Turkey), 4.0% (2/50) countries with lower middle-income economies (Ghana and India), and 0% (0/29) countries with low-income economies. Of the studies 39.3% (24/61) were conducted at a national level, 60.7% (n = 37) at a subnational level (Supplementary Table 3).[5,6,8,9,11,14–81] Nation-wide studies were carried out in 19 (65.5%) of the 29 countries reviewed. The number of studies per country varied from 1 to 8.

Regarding sampling methods, 55.7% (n = 34) of the studies utilized a probability sample and 36.1% (22) used a nonprobability sample. For 8.2% (5) of the studies, the sample design was not specified (one conference abstract, two abstracts of non-English articles, and two full-text articles). Probability sample designs included a stratified random sample (n = 18), a simple random sample (8), a probability sample with quotas (3), a systematic

random sample (2), and a random sample of unspecified type (3). Nonprobability sampling methods included a convenience sample (12), a quota sample (7), a voluntary response sample (2) and a snowball sample (1).

The number of survey respondents varied from 303 to 228,921 (median [interquartile range, IQR], 1,007 [566.5–2,077.0]), national studies 428 to 228,921, and subnational studies 303 to 10,048. Out of a total number of 428,340 respondents, 53.4% (228,921) were participants in the nation-wide survey from South Korea.[46] Sample size justification was provided in 30.6% (15/49) of the English language articles.

Sampling criteria by age included: > 12 years old (n = 1), > 14 (n = 1), > 15 (n = 1), > 16 (n = 5), > 17 (n = 2), > 18 (n = 21), > 19 (n = 7), > 20 (n = 1), > 30 (n = 1), 15–64 (n = 2), 15–79 (n = 1), 16–75 (n = 1), 18–69 (n = 1), 18–79 (n = 1), 18–89 years old (n = 1), adults (n = 4), age not limited (n = 2); or age criteria were not specified (n = 8). Seven (11.5%) surveys excluded persons with medical background or medical education.

As regards methods for gathering data, the studies utilized a telephone survey (n = 21, 34.4%), a face-to-face interview (n = 17, 27.9%), a self-completing questionnaire (n = 11, 18.0%) and an online survey (n = 6, 9.8%). For six studies (9.8%) the method of gathering survey data was not detailed (stated as "interview," "survey," or "questionnaire survey"). Of the surveys 24.6% (n = 15) were carried out in public places (gatherings), 18.0% (n = 11) were interviews conducted in households. Out of the six online surveys, five questioned laypeople interested/registered to participate in surveys (online survey panelists) and one involved users of online social networks.

The response rates were reported or calculable from available data for 41.0% (n = 25) of the studies. The response rates ranged from 30% to 95% (median [IQR], 52 [43.0–64.0]), telephone surveys 30% to 81% (n = 15), face-to-face interviews 47% to 95% (n = 4), questionnaire self-completion 50% to 87% (n = 5), and online surveys 58% (n = 1).

Prevalence of CPR training

The proportion of laypeople ever being trained in CPR varied from 3% to 79% globally (median [IQR], 40 [28.5–60.0]) (Fig. 3),[5,6,8,9,11,14–81] from 18% to 73% based on the national studies (39.5 [30.3–58.3]), and from 3% to 79% according to the subnational studies (40 [24.5–62.0]) (Supplementary Table 3). By the country's income level, the range of CPR training rates were distributed as follows: high income 4% to 79% (median [IQR], 50 [35.0–64.8]), upper middle income 3% to 53% (23 [12.0–38.0]), and lower middle income 3% to 31% (17 [not calculable]).

In terms of how recent the CPR training was 32.8% (n = 20) of
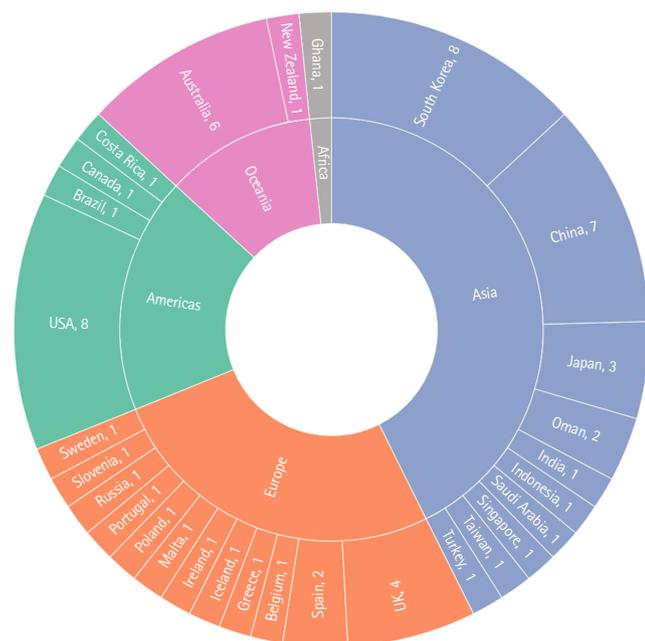
Fig. 2. Geographic distribution of surveys reporting prevalence of cardiopulmonary resuscitation training among the general public. Numbers indicate quantity of surveys per country.
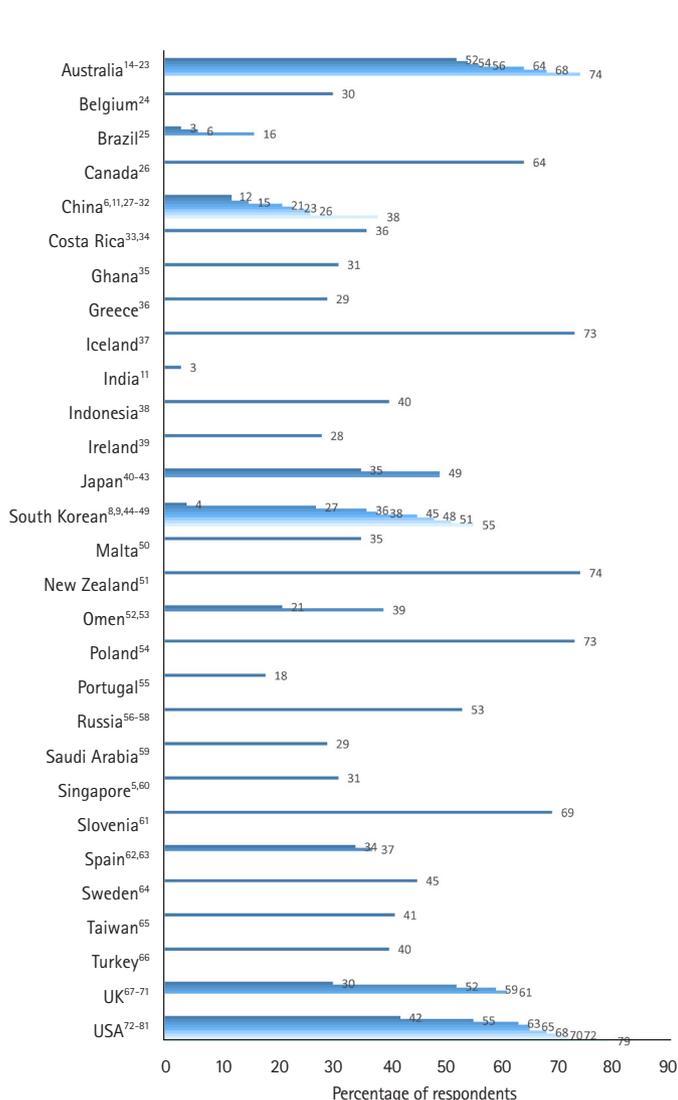
Fig. 3. Prevalence of cardiopulmonary resuscitation training by country (percentage of survey respondents ever trained in cardiopulmonary resuscitation).

Fig. 4. Percentages of lay people trained in cardiopulmonary resuscitation (CPR), categorized by time since last training (percentage out of ever trained in CPR).

the studies reported percentage or number of people trained in CPR within the past 12 months (2%–34% of those ever trained in CPR; median [IQR], 22 [17.5–27.8]). Data were also provided for longer periods and are reported here as the percentage /number of people trained over the period for 2, 5 and more than 5 years, detailing the median and IQR. Thus, of the studies 23% reported the percentage of people trained within the past 2 years, the median and the IQR (4%–60%, 38.5 [30.0–49.5]), 29.5% of the studies reported the percentage/number of people trained within past 5 years (12%–85%, 54 [45.0–65.3]); and 31.1% (19) of the studies reported the percentage/number of people trained more than 5 years ago (16%–86%, 47.0 [35.0–54.0]) (Fig. 4).[8,9,15,18,19,22,23,27,29,35,36,39,42,44-46,49,51,52,58,61,62,65,67,71,74,81]

Several studies investigated the prevalence of CPR training in the same population and geography in different study periods. These studies were carried out in four countries: Australia, China, Japan, and South Korea.

In Australia, two cross-sectional telephone surveys were conducted in 2000 to 2001[19] and 2016[21,22] among residents of the state of Victoria (n = 1,489 and 404, respectively), demonstrating an improvement in the CPR training prevalence. The percentage of people ever trained in CPR increased from 52% to 68%, and the percentage of those recently trained (within 1 year) increased from 21% to 28%.

In China, the general public of Hong Kong region was interviewed by telephone in 2002 (n = 357)[27] and in 2010 (n = 1,013).[28,29] Based on the surveys, the overall prevalence of CPR training was 12% and 21%, respectively. Another telephone survey from Hong

Kong (n = 524) showed the CPR training rate of 23% but the year of the survey is unknown.[32] Additionally, two nation-wide surveys were carried out in China in 2014 (n = 1,841; an online survey)[6] and 2018 to 2019 (n = 99,186; a self-administered questionnaire),[30] reporting the percentages of people ever trained in CPR as 26 and 38, respectively.

In Japan, two country-wide surveys were conducted in 2006 (n = 1,132; in-home face-to-face interviews)[40] and in 2012 (n = 4,853; an online survey).[41,42] These studies showed the community prevalence of ever being trained in CPR to be 35% and 49%, respectively.

For South Korea, Lee et al.[8] and Lee et al.[45] published results of three country-wide telephone surveys conducted in 2007 (n = 1,029), 2011 (n = 1,000), and 2015 (n = 1,000). The reported percentages of ever being trained in CPR were 48, 38, and 51%, respectively, with the percentages of people trained within the previous 2 years reaching 30, 49, and 60%, respectively. Further, Ro et al.[46] presented the results of the nation-wide in-home face-to-face interview conducted in 2012 (n = 228,921), where the general prevalence of CPR training was reported as 27%, and the proportion of those trained within 2 years amounted to 42%. Finally, two in-home face-to-face surveys conducted in the Korean metropolitan city Daegu in 2012 (n = 1,000)[9,47,49] and 2016 (n = 1,141)[9,47] demonstrated an increase in prevalence of ever being trained in CPR (from 36% to 55%) and in the proportion of laypeople trained within 2 years (from 47% to 55%).

Factors associated with receiving CPR training

Thirty of 61 eligible studies (49.2%) investigated the association of participants' sociodemographic characteristics with being previously trained in CPR. Based on a univariate or a multivariate analysis, prior experience of CPR training was confirmed to be associated with (excluding factors evaluated on a single occasion): age: younger (n = 18 studies) or middle age (n = 5) vs. older age; gender: man (n = 9), woman (n = 2), or not associated (n = 12); race, ethnicity or country of birth (n = 5), or not associated (n = 1); educational level: higher (n = 17), or not associated (n = 1); socioeconomic status: higher (n = 2), or not associated (n = 1); income: higher (n = 5), or not associated (n = 3); employment status or occupation: employed/students (n = 6), full-time/part-time work (n = 2), working in a medical field (health-related, healthcare providers) (n = 3), office workers or skilled workers (n = 1), professional, managerial, and non-manual occupations (n = 2), military conscripts (n = 1), or not associated with employment status (n = 1); marital status: non-married vs. married (n = 1), never been married (n = 2), married or never been married vs. separated or divorced (n = 1), married vs. single, divorced or widowed (n = 1), married or living as married (n = 1); place of residence (urban/rural): urban (n = 1), rural (n = 1), or not associated (n = 2); witnessed a cardiac arrest or a collapsed person (n = 3), or not associated (n = 1); member of a household (cohabiting family member) with heart disease or cardiovascular disease: positive association (n = 1), negative association (n = 1), or

Table 1. Respondents' three main reasons for not being trained in cardiopulmonary resuscitation

Country, year	Top 1 barrier	Top 2 barrier	Top 3 barrier
Australia, 2016[22,a)]	Never thought about it/about the need to go for training (59%)*	Lack of time/no time (25%)†	Do not know where to take the training (15%)†
Australia, 2017[23]	Never thought about it/about the need to go for training (44%)*	Do not know where to take the training (21%)†	Cost (12%)§
China, 2002[27]	Lack of time/no time (33%)†	Do not know where to take the training (28%)†	Have no (little) interest/lack of concern (20%)∏
China, 2010[29]	Lack of time/no time (41%)†	Not necessary/don't believe it's important (26%)#	Have no (little) interest/lack of concern (19%)∏
China, 2014[6]	Do not know where to take the training (55%)†	Lack of time/no time (20%)†	Have no (little) interest/lack of concern (11%)∏
Greece, unknown year[36]	Lack of infrastructure[b)] (49%)†	Do not know where to take the training (24%)	Lack of time/no time (20%)†
Oman, 2014[52,a)]	Do not know where to take the training (34%)†	Lack of time/no time (29%)†	Not necessary/don't believe it's important (23%)#
Russia, 2018[58,a)]	Never thought about it/about the need to go for training (51%)*	Do not know where to take the training (28%)†	Not necessary/don't believe it's important (10%)#
Spain, 2015[62]	Had not had any opportunity to receive the training (61%)§	Have no (little) interest/lack of concern (30%)∏	Lack of time/no time (8%)†
Sweden, 2000[64,a)]	Unaware that such training exists (28%)§	Have no (little) interest/lack of concern (21%)∏	Do not know where to take the training (19%)†
The USA, 2008[81]	Had not gotten around to it (41%)§	Not necessary/don't believe it's important (10%)#	There was no available training (10%)†

*, †, ‡, §, ∏, # symbols indicate the same or similar barriers.
a)Multiple-choice question. b)Lack of organized lessons, instructors or institutions.

Table 2. Respondents' three main sources of cardiopulmonary resuscitation training

Country, year	Top 1 source	Top 2 source	Top 3 source
Australia, 2005[20]	Recognized provider[a] (58%)*	-	-
Australia, 2016[22]	Recognized provider[a] (43%)*	Workplace (40%)[†]	School (9%)[†]
China, 2002[27]	Recognized provider[a] (64%)*	-	-
China, 2010[29]	Recognized provider[a] (63%)*	Workplace (16%)[†]	-
South Korea, 2006[44]	Military/reserve forces (42%)[§]	School, college, university (33%)[†]	Workplace (6%)[†]
South Korea, 2007[8]	Military/reserve forces (48%)[§]	School, college, university (30%)[†]	Workplace (6%)[†]
South Korea, 2011[8]	Military/reserve forces (44%)[§]	School, college, university (21%)[†]	Recognized provider[a] (11%)*
South Korea, 2012[9,b]	School (22%)[†]	Military/reserve forces (17%)[§]	Emergency dispatch center, fire department (16%)*
South Korea, 2016[9,b]	School (29%)[†]	Workplace (22%)[†]	Military/reserve forces (17%)[§]
New Zealand, 2002[51]	Workplace (44%)[†]	School (20%)[†]	Sports groups (8%)[∏]
Poland, 1997[54,b]	School (69%)[†]	Workplace (55%)[†]	Military/reserve forces (27%)[§]
Portugal, 2012[55]	Recognized provider[a] (24%)*	Qualified training centers (22%)*	Higher education institution (17%)[†]
Russia, 2018[58,b]	School, college, university (28%)[†]	Workplace and service (incl. military) (27%)[†]	Driving school (21%)[#]
Saudi Arabia, 2018[59,b]	Television, internet, media (25%)[∏]	Course given by the trainers of the Ministry of Health (21%)*	Workplace (17%)[†]
Spain, 2015[62]	Workplace (37%)[†]	Recognized provider[a] (26%)*	School, college, university (10%)[†]
Turkey, unknown year[66]	Workplace (8%)[†]	Driving school (7%)[#]	-
UK (whole), 2017[71,b]	Workplace (55%)[†]	School (15%)[†]	Community building[c] (14%)[∏]
UK (England), 2014[68]	Workplace (63%)[†]	School, college, university (22%)[†]	Recognized provider[a] (11%)*

*, [†], [‡], [§], [∏], [#] symbols indicate the same or similar sources of training.

[a]The Red Cross, St. John Ambulance, emergency medical services, etc. [b]Multiple-choice question. [c]For example, village or community hall, school (not as a student).
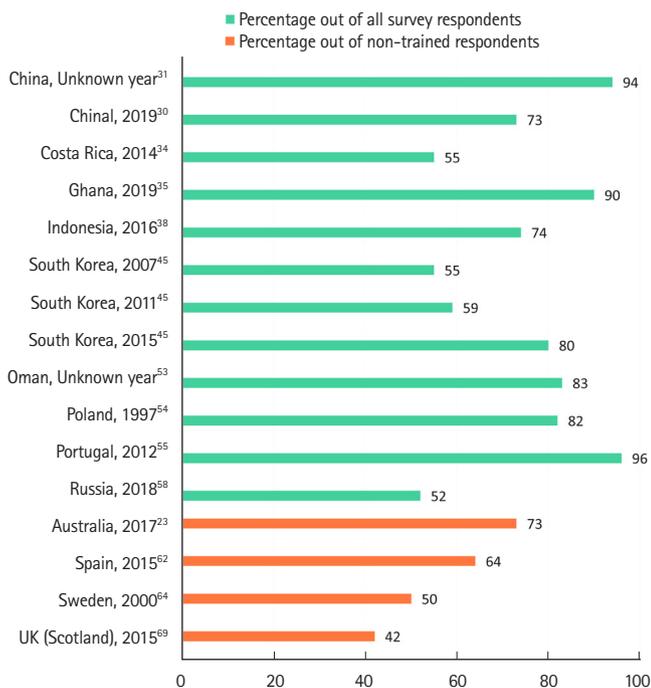
Fig. 5. Willingness of laypeople to get trained in CPR.

not associated (n = 2); diseases in personal medical history: negative association (n = 1), or not associated (n = 1).

Barriers for CPR training

Eleven studies (18.0%) evaluated reasons for not being trained in CPR. The most common barriers are summarized in Table 1.[6,22,23,27,29,36,52,58,62,64,81]

Sources of CPR training

Eighteen studies (29.5%) inquired about the places where respondents had undergone CPR training. Table 2 shows the most common sources of training.[8,9,20,22,27,29,44,51,54,55,58,59,62,66,68,71]

Willingness to be trained

Sixteen studies (26.2%) evaluated the willingness of laypeople to be trained in (to learn) CPR. Of these, 12 studies reported the proportions of persons willing to be trained out of all the survey respondents (ranging from 52% to 96%); four studies asked this question of non-trained respondents only, and received positive responses from 42% to 73% respondents (Fig. 5).[23,30,31,34,35,38,45,53-55,58,62,64,69]

DISCUSSION

This scoping review investigated the international evidence from the population-based surveys reporting the prevalence of CPR training among the general public over the last 20 years. The review reveals the occurrence and geographic distribution of the

studies, clarifies the study design and the conduct of the research, identifies the knowledge gaps, and may inform future systematic reviews on the topic. The findings may be utilized by national and international authorities when planning public health initiatives directed at improving bystander CPR rates and increasing the survival rates after OHCA.

We found that studies of CPR training prevalence among the general public are occasional. For the past two decades, only 61 published studies were revealed. The studies were conducted in 29 countries, which amounts to about one seventh of the world's sovereign states. No data on CPR training prevalence is available for low-income countries and only two studies were carried out in lower middle-income countries (Ghana and India). The surveys were most commonly performed in South Korea (8) and the USA (8), followed by China (7), Australia (6), the UK (4), Japan (3), Oman (2), and Spain (2). In the other 21 countries the studies were only conducted once. It is noteworthy that although the surveys were more common in countries with higher income economies, our search did not reveal any eligible studies for approximately 75% of the high-income countries and 89% of the countries with upper middle-income economies. Most surveys were carried out at a subnational level, and may not be considered as representative of the whole country. Furthermore, the majority of studies were conducted at a single point in time, and only a few surveys were repeated in the same population to show the dynamics of CPR training prevalence in a particular geographic area. Generally, the lack of studies suggests lack of measurement and monitoring of community CPR training in most countries, that in turn may suggest insufficient regard being given to the problem of OHCA from the national governments and healthcare agencies.

Another important finding is that the studies demonstrated significant methodological heterogeneity in the study design, sampling methods, data gathering methods, and participant selection criteria. Whereas the choice of the survey design largely depends on availability of certain modes of data gathering and their cost for the researcher, clearly these methodological differences may introduce diverse and pronounced biases inherent to non-standardized population-based surveys thus limiting comparability of the survey results. Many surveys had low response rates that might have led to non-response biases affecting the representativeness of the data. Further, in a number of cases the description of key methodological aspects was lacking in the full-text papers, preventing clear conclusions on the appropriateness of the study design used to achieve the aims of the study.

In order to improve the methodological consistency and comparability of future studies, it is advisable to develop international

guidelines on survey methodology and uniform reporting of data on public CPR training practices. Following the Utstein style, the guidelines could be jointly developed by the recognized resuscitation societies to include uniform terms, definitions, methods, and a template for standardized reporting of survey results. The guidelines could serve as a valuable driver for supporting resuscitation research and in improving public health internationally. The incorporation of questions concerning CPR training into well-designed national public surveys could assist in obtaining reliable surveillance data on a regular basis.

Although pronounced methodological differences prohibit direct comparison of the presented results, the data demonstrate overall trends in the prevalence of CPR training among the general public. The huge variation in the CPR training rates (3%–79%) could be attributed to complex factors, including real disparities in existing practices of community resuscitation training between countries and regions, as well as differences in study design, research quality and reporting. Whereas the global prevalence of CPR training around 40% seem to be relatively high,[11,25] it is definitely far from sufficient. Most studies were conducted in developed countries, where extensive campaigns are organized to engage the public and encourage CPR training.[8,9] Countries with high-income economies demonstrated more than double the median prevalence of CPR training when compared with the upper middle-income countries. The difference is anticipated to be much more pronounced in comparison with lower middle-income and low-income countries where public CPR training initiatives seldom occur,[82] but where the mortality rate from non-communicable diseases continues to increase dramatically.

The proportion of people with recent CPR training was generally low and did not exceed 34% trained within one year across the studies, indicating the need to promote refresher training in resuscitation around the globe. Recent CPR training is a valuable indicator of the effectiveness of community resuscitation education effectiveness.

However, recency of CPR training was reported rarely and non-uniformly, once again suggesting the need for the international consensus in this matter.

All studies reporting the prevalence of CPR training in particular geographic areas at different time points, which were conducted in Australia,[19,21,22] China,[6,27-30] Japan[40-42] and South Korea,[8,9,45-47,49] demonstrated an improvement in the general rates of resuscitation training and the rates of recent CPR training over time. Some of the papers discuss factors which may have contributed to the positive dynamics. For the Australian state of Victoria[22] and for Hong Kong,[29] first-aid training in the workplace appeared to be one of the drivers for the increase in the propor-

tion of CPR-trained individuals. In South Korea, the increase in the percentage of people ever trained and those recently trained in CPR, was related to a complex of major changes in public resuscitation training-related national practices, including the establishment of the national public CPR program, public advertising campaigns, enactment of a Good Samaritan law, and legislation for mandatory CPR training at school.[8,9]

Besides the resuscitation training prevalence, some studies investigated associations between respondents' demographic and socioeconomic characteristics and previous CPR training, reasons for not being trained in CPR, sources of resuscitation training, and willingness to get trained in CPR. Although important for understanding community CPR education practices and informing further improvements, these findings were reported by a minority of studies, and in a heterogeneous manner. Age, gender, educational level, and employment status/occupation were most commonly evaluated as potential determinants of previous resuscitation training. Younger age and higher level of education were consistently reported to be associated with a higher probability of ever being trained in CPR in different countries. Consequently, involvement of older people and those who have lower education level into community resuscitation training constitutes an international objective.

The most frequently reported reasons for not being trained in CPR generally fell into two categories: (1) low awareness and motivation to go for training (e.g., "never thought about it", lack of concern, lack of time) and (2) low availability of CPR training ("do not know where to take the training"). This emphasizes the need for raising awareness of cardiac arrest and CPR training for laypeople, introducing mandatory CPR education and increasing access to alternative methods of training, including distance learning and blended learning approaches[7] worldwide.

The main sources of CPR training were generally similar across the countries, but varied in their order of prevalence. Most commonly, people were receiving training in educational institutions (school, college, and university), at workplace or from recognized providers (e.g., The Red Cross or emergency medical services). For South Korea, training through military/reserve forces was reported as the most common source before 2012,[8] with the subsequent shift towards the most prevalent training occurring at school.[9]

The reported proportions of people being interested in attending CPR training varied over a wide range, but generally was no less than 50% of respondents who declared their willingness to undertake the training. These findings reveal a large potential for increasing the number of lay rescuers internationally.

This review has limitations. The scoping nature of the review prevented us from performing a systematic quality appraisal of the studies. Owing to the differences in survey design, methods, target populations, and reporting, as well as commonly encountered lack of relevant information on the methodologies used, the findings should be interpreted cautiously. Despite the comprehensive search for publications, it is possible that some eligible papers were not included due to the limitations of the search strategy, particularly those published in languages other than English and not indexed in the major bibliographic databases. For non-English articles (n = 4), we analyzed English-language abstracts and tables only; thus, relevant data might have been omitted for the respective studies. Further, not all research gets published in scientific literature, and therefore the results of this review may not be representative of all the studies that have been conducted to investigate the prevalence of community CPR training. Finally, the prevalence rates of resuscitation training should not be interpreted as an equivalent of quality or effectiveness of public CPR training in the respective countries.

CONCLUSION

In summary, this review has shown that studies investigating the prevalence of CPR training among the general public are few around the globe. Nothing is known about existing community resuscitation education coverage for the vast majority of countries of the world, and for most surveys the findings are not generalizable to a whole country population. Based on the available evidence from 29 countries, the global prevalence of CPR training is around 40% with obviously higher training rates in countries with higher income economies. Whereas some countries definitely reveal an increase in CPR training prevalence over time; there is an apparent need to further improve public awareness and education on resuscitation internationally. The review also revealed that studies are highly heterogeneous in survey designs, methods, and reporting patterns, making it difficult to interpret and compare findings. There is a need to develop international consensus guidelines on a standardized survey methodology and reporting of data on CPR training practices in order to enhance the consistency and the availability of resuscitation training monitoring, to guide CPR education processes and improve survival from cardiac arrest worldwide.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

SUPPLEMENTARY MATERIAL

Supplementary Tables are available from: https://doi.org/10.15441/ceem.21.066.

Supplementary Table 1. Search strategy (Medline)

Supplementary Table 2. Characteristics of studies included in the review (n = 61)

Supplementary Table 3. Prevalence of CPR training (percentage of persons ever trained) by country, territorial level and year of survey

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Supplementary Table 1. Search strategy (Medline)

01. basic life support[Title/Abstract]
02. BLS[Title/Abstract]
03. cardiopulmonary resuscitation[Title/Abstract]
04. CPR[Title/Abstract]
05. first aid[Title/Abstract]
06. resuscitation[Title/Abstract]
07. *1 or 2 or 3 or 4 or 5 or 6*
08. attitude*[Title/Abstract]
09. educat*[Title/Abstract]
10. knowledge[Title/Abstract]
11. learn*[Title/Abstract]
12. teach*[Title/Abstract]
13. train*[Title/Abstract]
14. *8 or 9 or 10 or 11 or 12 or 13*
15. citizen*[Title/Abstract]
16. community[Title/Abstract]
17. lay person*[Title/Abstract]
18. laypeople[Title/Abstract]
19. layperson*[Title/Abstract]
20. population*[Title/Abstract]
21. public[Title/Abstract]
22. resident*[Title/Abstract]
23. *15 or 16 or 17 or 18 or 19 or 20 or 21 or 22*
24. survey*[Title/Abstract]
25. interview*[Title/Abstract]
26. questionnaire*[Title/Abstract]
27. *24 or 25 or 26*
28. *"2000/01/01"[Date – Publication] : "3000"[Date – Publication]*
29. *7 and 14 and 23 and 27 and 28*

BLS, basic life support; CPR, cardiopulmonary resuscitation.

Supplementary Table 2. Characteristics of studies included in the review (n=61)

Country [Reference(s)]	Year(s) of survey	Method of gathering survey data	Target population	Range of study	Number of respondents	Age of respondents (yr)	Sampling method	Justified sample size	Response rate (%)	Ever trained in CPR (%)	Trained in CPR within previous 1 year (%)[1]	Trained in CPR within previous 2 years (%)[1]	Trained in CPR within previous 5 years (%)[1]	Trained in CPR over 5 years ago (%)[1]	Willing to be trained in CPR (%)
Australia [Clark et al., 2002; Johnston et al., 2003; Johnston et al., 2004]	1998	Telephone survey	General public	State (Queensland)	4,490	≥18	Stratified random sample	No	72	54	22	-	-	-	-
Australia [Jelinek et al., 2001; Celenza et al., 2002]	1999	Telephone survey	General public	State (Western Australia)	803	Adults	Stratified random sample	No	55	64	20	-	58	42	-
Australia [Smith et al., 2003]	2000–2001	Telephone survey	General public	State (Victoria)	1,489	Adults	Stratified random sample	Yes	52	52	21	-	-	-	-
Australia [Dwyer, 2008]	2005	Telephone survey	General public	Region (Central Queensland)	1,208	≥18	Simple random sample	No	39	74	-	-	-	-	-
Australia [Bray et al., 2016*; Bray et al., 2017]	2016	Telephone survey	General public	State (Victoria)	404	≥18	-	Yes	45	68	28	-	47	51	-
Australia [Cartledge et al., 2020]	2017	Online survey	General public (interested/registered to participate in surveys)	Country	1,076	≥18	Purposive non-probability sample (quota sample)	No	-	56	22	-	56	42	73[2]
Belgium [Scavee et al., 2011*]	-	Questionnaire self-completion (in public places + email)	General public	Country	2,070	≥16	Non-probability sample (convenience sample)	No	-	30	-	-	-	-	-
Brazil [Bartlett et al., 2020]	2017–2019	Face-to-face interview (household survey)	General public	Three municipalities (Padre Paraíso, Poções, Vitória da Conquista)	962 (Padre Paraíso), 1,019 (Poções), 1,054 (Vitória da Conquista)	≥30	Systematic random sample	Yes	-	3 (Padre Paraíso), 6 (Poções), 16 (Vitória da Conquista)	-	-	-	-	-
Canada [Cheskes et al., 2016]	-	Online survey	General public (interested/registered to participate in surveys)	Country	428	≥18	Non-probability sample (voluntary response sample)	Yes	-	64	-	-	-	-	-
China [Cheung et al., 2003]	2002	Telephone survey	General public	Region (Hong Kong)	357	≥16	Simple random sample	Yes	45	12	19	36	48	52	-

Supplementary Table 2. Continued

Country [Reference(s)]	Year(s) of survey	Method of gathering survey data	Target population	Range of study	Number of respondents	Age of respondents (yr)	Sampling method	Justified sample size	Response rate (%)	Ever trained in CPR (%)	Trained in CPR within previous 1 year (%)[1]	Trained in CPR within previous 2 years (%)[1]	Trained in CPR within previous 5 years (%)[1]	Trained in CPR over 5 years ago (%)[1]	Willing to be trained in CPR (%)
China [Hung et al., 2011*; Chair et al., 2014]	2010	Telephone survey	General public	Region (Hong Kong)	1,013	15–64	Simple random sample	Yes	46	21	-	-	-	51	-
China [Chen et al., 2017]	2014	Online survey	General public (interested/registered to participate in surveys; excluding medical-related persons)	Country	1,841	No limit	Simple random sample	No	-	26	-	-	-	-	-
China [Duber et al., 2018]	2015	Face-to-face interview (household survey)	General public	Metropolitan cities (Beijing, Shanghai)	1,524 (Beijing), 1,537 (Shanghai)	≥18	Stratified random sample	No	-	26 (Beijing), 15 (Shanghai)	-	-	-	-	-
China [Yan et al., 2020]	2018–2019	Questionnaire self-completion	General public	Country	99,186	≥18	Stratified random sample	No	57	38	-	-	-	-	73[3]
China [Liu et al., 2012*]	-	Questionnaire completion	General public	Metropolitan city (Zhengzhou)	338	-	-	No	-	12	-	-	-	-	94[3]
China [Chan and Chan, 2016*]	-	Telephone survey	General public	Region (Hong Kong)	524	-	-	No	-	23	-	-	-	-	-
Costa Rica [Schmid et al., 2015*; Schmid et al., 2016]	2014	Face-to-face interview (in public gathering places)	General public	Metropolitan city (San José)	370	-	Non-probability sample (convenience sample)	No	-	36	-	-	-	-	55[3]
Ghana [Anto-Ocrah et al., 2020]	2019	Online survey	General public (social media networks users)	Country	479	≥18	Non-probability sample (snowball sample)	Yes	-	31	34	51	82	18	90[3]
Greece [Hatzakis et al., 2008]	-	Telephone survey	General public	County (Heraklion)	390	≥18	Simple random sample	No	81	29	30	-	65	35	-
Iceland [Arnar et al., 2001*]	-	Telephone survey	General public	Country	804	16–75	Random sample (type unknown)	No	-	73	-	-	-	-	-
India [Duber et al. 2018]	2015	Face-to-face interview (household survey)	General public	Metropolitan city (Bangalore)	2,400	≥18	Stratified random sample	No	-	3	-	-	-	-	-
Indonesia [Pranata et al., 2020]	2016	Questionnaire self-completion (in public places)	General public (excluding persons with medical background)	Metropolitan city (Jakarta)	303	>17	Non-probability sample (convenience sample)	No	87	40	-	-	-	-	74[3]

(continued to the next page)

Supplementary Table 2. Continued

Country [Reference(s)]	Year(s) of survey	Method of gathering survey data	Target population	Range of study	Number of respondents	Age of respondents (yr)	Sampling method	Justified sample size	Response rate (%)	Ever trained in CPR (%)	Trained in CPR within previous 1 year (%)[1]	Trained in CPR within previous 2 years (%)[1]	Trained in CPR within previous 5 years (%)[1]	Trained in CPR over 5 years ago (%)[1]	Willing to be trained in CPR (%)
Ireland [Jennings et al., 2009]	2008	Face-to-face interview (in-home)	General public	Country	974	≥16	Purposive non-probability sample (quota sample)	Yes	-	28	-	38	85	-	-
Japan [Kuramoto et al., 2008]	2006	Face-to-face interview (in-home)	General public	Country	1,132	15–79	Stratified random sample	No	47	35	-	-	-	-	-
Japan [Sasaki et al., 2012*; Sasaki et al., 2015]	2012	Online survey	General public (interested/registered to participate in surveys; excluding persons with medical education and healthcare professionals)	Country	4,853	≥15	Stratified random sample	No	58	49	11	-	72	28	-
Japan [Otani et al., 2011*]	-	Questionnaire self-completion (in public places)	General public	Metropolitan city (Hiroshima)	5,956	-	Non-probability sample (convenience sample)	No	60	49	-	-	-	-	-
Korea [Lee et al., 2008*]	2006	Telephone survey	General public	Metropolitan city (Seoul)	1,007	≥19	Random sample (type unknown)	No	-	45	21	30	-	-	-
Korea [Lee et al., 2013; Lee et al., 2016*]	2007	Telephone survey	General public	Country	1,029	≥19	Stratified random sample	No	41	48	-	30	40	60	553
Korea [Lee et al., 2013; Lee et al., 2016*]	2011	Telephone survey	General public	Country	1,000	≥19	Stratified random sample	No	37	38	-	49	63	37	593
Korea [Moon et al., 2017*; Son et al., 2017; Moon et al., 2019]	2012	Face-to-face interview (in-home)	General public	Metropolitan city (Daegu)	1,000	≥19	Probability quota sample	No	-	36	27	47	66	31	-
Korea [Ro et al., 2016]	2012	Face-to-face interview (in-home)	General public	Country	228,921	≥19	Stratified random sample	No	-	27	-	42	-	-	-
Korea [Lee et al., 2016*]	2015	Telephone survey	General public	Country	1,000	≥19	Stratified random sample	No	-	51	-	60	-	-	803
Korea [Moon et al., 2017*; Moon et al., 2019]	2016	Face-to-face interview (in-home)	General public	Metropolitan city (Daegu)	1,141	≥19	Probability quota sample	No	-	55	-	55	-	-	-

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Supplementary Table 2. Continued

Country [Reference(s)]	Year(s) of survey	Method of gathering survey data	Target population	Range of study	Number of respondents	Age of respondents (yr)	Sampling method	Justified sample size	Response rate (%)	Ever trained in CPR (%)	Trained in CPR within previous 1 year (%)[1]	Trained in CPR within previous 2 years (%)[1]	Trained in CPR within previous 5 years (%)[1]	Trained in CPR over 5 years ago (%)[1]	Willing to be trained in CPR (%)
Korea [Kang et al., 2006*]	-	Survey	General public	Metropolitan city (Incheon)	5,114	Adults	-	No	-	4	-	-	-	-	-
Malta [Caruana et al., 2013*]	-	Interview	General public	Country	656	-	Probability quota sample	No	-	35	-	-	-	-	-
New Zealand [Larsen et al., 2004]	2002	Telephone survey	General public	Metropolitan city (Wellington)	400	>17	Systematic random sample	No	76	74	12	-	37	63	-
Oman [Alshaqsi et al., 2015]	2014	Face-to-face interview (in public places)	General public	Five cities (Muscat, Sur, Ibri, Nizwa, Salalah)	873	-	Non-probability sample (convenience sample)	No	58	39	26	-	-	-	-
Oman [Al-Riyami et al., 2019*]	-	Questionnaire completion (in public places)	General public (excluding persons with medical background)	Country	924	-	Non-probability sample (convenience sample)	No	-	21	-	-	-	-	83[3]
Poland [Rasmus and Czekajlo, 2000]	1997	Questionnaire self-completion	General public	Country	1,092	-	Random sample (type unknown)	No	-	73	-	-	-	-	82[3]
Portugal [Dixe and Gomes, 2015]	2010-2012	Questionnaire self-completion (at workplace)	General public (employees of public and private institutions)	Country	1,700	≥18	Non-probability sample (convenience sample)	No	-	18	-	-	-	-	96[3]
Russia [Birkun and Kosova, 2018a; Birkun and Kosova, 2018b*; Birkun and Kosova, 2018c]	2017-2018	Face-to-face interview (in public places)	General public	Region (Crimean peninsula)	384	≥18	Purposive non-probability sample (quota sample)	Yes	95	53	24	-	42	54	52[3]
Saudi Arabia [Qara et al., 2019]	2018	Questionnaire self-completion	General public (excluding healthcare providers)	Metropolitan city (Jeddah)	600	≥18	-	No	-	29	-	-	-	-	-
Singapore [Quah et al., 2012*; Ong et al., 2013]	2009-2010	Face-to-face interview (in-home)	General public	Country	4,192	18-69	Simple random sample	No	65	31	-	-	-	-	-

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Supplementary Table 2. Continued

Country [Reference(s)]	Year(s) of survey	Method of gathering survey data	Target population	Range of study	Number of respondents	Age of respondents (yr)	Sampling method	Justified sample size	Response rate (%)	Ever trained in CPR (%)	Trained in CPR within previous 1 year (%)[1]	Trained in CPR within previous 2 years (%)[1]	Trained in CPR within previous 5 years (%)[1]	Trained in CPR over 5 years ago (%)[1]	Willing to be trained in CPR (%)
Slovenia [Rajapakse et al., 2010]	2006	Telephone survey	General public (excluding persons with medical education background)	Country	500	≥18	Simple random sample	Yes	30	69	2	4	12	86	-
Spain [Ballesteros-Peña et al., 2016]	2015	Face-to-face interview (in public places)	General public (excluding persons with healthcare education)	Metropolitan cities of the Basque Country (Bilbao, San Sebastian, Vitoria)	605	15–64	Purposive non-probability sample (quota sample)	Yes	-	37	29	39	59	42	642
Spain [Rafecas Ventosa et al., 2017*]	2016	Questionnaire completion (in public places)	General public	Metropolitan city (Barcelona)	3,067	≥12	Non-probability sample (voluntary response sample)	No	-	34	-	-	-	-	-
Sweden [Axelsson et al., 2006]	2000	Questionnaire self-completion (postal)	General public	Country	3,167	18–79	Stratified random sample	No	63	45	-	-	-	-	502
Taiwan [Pei-Chuan Huang et al., 2019]	2013	Telephone survey	General public	Country	1,073	≥20	Stratified random sample	Yes	32	41	22	35	52	47	-
The UK, England [Donohoe et al., 2006]	2003	Face-to-face interview (in-home)	General public	County (Greater London)	1,011	>16	Purposive non-probability sample (quota sample)	No	-	30	33	-	-	16	-
The UK, England [Brooks et al., 2015]	2014	Face-to-face interview (in a shopping centre)	General public	City (Southampton)	1,004	No limit	Non-probability sample (convenience sample)	No	-	61	-	-	-	-	-
The UK, Scotland [Dobbie et al., 2018]	2015	Face-to-face interview (in-home)	General public	Country (Scotland)	1,027	≥16	Purposive non-probability sample (quota sample)	No	-	52	-	-	-	-	422
The UK, whole [Hawkes et al., 2017*; Hawkes et al., 2019]	2017	Online survey	General public (interested/registered to participate in surveys)	Country	2,084	≥18	Purposive non-probability sample (quota sample)	No	-	59	17	-	46	54	-

Supplementary Table 2. Continued

Country [Reference(s)]	Year(s) of survey	Method of gathering survey data	Target population	Range of study	Number of respondents	Age of respondents (yr)	Sampling method	Justified sample size	Response rate (%)	Ever trained in CPR (%)	Trained in CPR within previous 1 year (%)[1]	Trained in CPR within previous 2 years (%)[1]	Trained in CPR within previous 5 years (%)[1]	Trained in CPR over 5 years ago (%)[1]	Willing to be trained in CPR (%)
The USA [Barnhart et al., 2005]	2000	Telephone survey	General public	Six counties in three states (Hartford County, Connecticut; Manhattan and Suffolk Counties, New York; Camden and Bergen/Passaic Counties, New Jersey)	1,880	≥18	Simple random sample	No	50	42	-	-	-	-	-
The USA [Coons and Guy, 2009]	2008	Questionnaire self-completion (postal)	General public	Two counties in one state (Maricopa County, Santa Cruz County, Arizona)	755	≥18	Stratified random sample	Yes	50	55 (rural), 63 (urban)	-	-	-	-	-
The USA [Sipsma et al., 2011]	2008	Telephone survey	General public	County (King County, Washington)	1,001	≥18	Stratified random sample	Yes	39	79	17	-	46	53	-
The USA [Blewer et al., 2015*; Murray et al., 2016*]	2014–2015	Telephone survey	General public	Region in a state (Southeastern Pennsylvania)	10,048	Adults	Stratified random sample	No	-	65	-	-	-	-	-
The USA [Blewer et al., 2017; Blewer, 2018*]	2015	Telephone survey	General public	Country	9,022	≥18	Stratified random sample	No	-	65	-	28	-	-	-
The USA [Fratta et al., 2020]	2015–2017	Questionnaire self-completion (at public gatherings)	General public	Metropolitan city (Baltimore, Maryland)	516	≥14	Non-probability sample (convenience sample)	No	-	68	-	-	-	-	-
The USA [Petruncio et al., 2018]	2016	Face-to-face interview (in a shopping center)	General public	County (Charleston County, South Carolina)	318	≥18	Non-probability sample (convenience sample)	No	-	70	-	-	-	-	-
The USA [Knapp et al., 2018*]	-	Survey (in public places)	General public	City (Norfolk, Virginia)	712	18–89	Non-probability sample (convenience sample)	No	-	72	-	-	-	-	-

CPR, cardiopulmonary resuscitation.

*Conference abstracts, dissertation abstract [Blewer, 2018] and non-English articles (data from English-language abstracts and tables only); em dash – no data/unknown.

[1]Percentage out of respondents who were trained in CPR. [2]Percentage out of respondents who were not trained in CPR. [3]Percentage out of all respondents.

Supplementary Table 3. Prevalence of CPR training (percentage of persons ever trained) by country, territorial level and year of survey

Countries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Unknown	Range, %
Australia		54[14-16]	64[17,18]		52[19]				74[20]											68[21,22]	56[23]				52-74
Belgium																								30[24]	30
Brazil																					3[25,*] 6[25,*]		16[25,*]		3-16
Canada																								64[26]	64
China						12[27]								21[28,29]				26[6]	15[11,†] 26[11,†]				38[30]	12[31] 23[32]	12-38
Costa Rica																		36[33,34]							36
Ghana																							31[35]		31
Greece																								29[36]	29
Iceland																								73[37]	73
India																			3[11]						3
Indonesia																				40[38]					40
Ireland												28[39]													28
Japan										35[40]						49[41,42]								49[43]	35-49
South Korea										45[44]	48[8,45]				38[8,45]	27[46] 36[9,47,49]			51[45]	55[9,47]				4[48]	4-55
Malta																								35[50]	35
New Zealand						74[51]																			74
Oman																		39[52]						21[53]	21-39
Poland	73[54]																								73
Portugal																18[55]									18
Russia																						53[56-58]			53
Saudi Arabia																						29[59]			29
Singapore														31[5,60]											31
Slovenia										69[61]															69
Spain																			37[62]	34[63]					34-37
Sweden				45[64]																					45
Taiwan																	41[65]								41
Turkey																								40[66]	40
UK							30[67]											61[68]	52[69,†]		59[70,71]				30-61
USA				42[72]								55[73,§] 63[73,§] 79[81]							65[74,75] 65[79,80]	70[76]	68[77]			72[78]	42-79

Territorial levels of the surveys are encoded with color: national, light-green; constituent unit(s)/state(s)/region(s), light-blue; municipality(ies)/county(ies), pink; metropolitan city(ies)/city(ies), yellow. Superscript numbers are reference numbers.

CPR, cardiopulmonary resuscitation.

*The rates reported by the same study separately for three municipalities. †The rates reported by the same study separately for three municipalities. ‡The rates reported by the same study separately for two metropolitan cities. §The nation-wide study for the population of Scotland. ‖The rates reported by the same study separately for rural (55%) and urban (63%) populations.