

Clinical paper

Performing bystander CPR for sudden cardiac arrest: Behavioral intentions among the general adult population in Arizona[☆]

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ABSTRACT

Study objectives: The odds of surviving an out-of-hospital cardiac arrest are significantly improved by the provision of bystander cardiopulmonary resuscitation (CPR), but many cardiac arrest victims do not receive it. The existing literature remains equivocal as to why people are unwilling to perform traditional CPR. This study's objectives were to determine the behavioral intentions of the general population in Arizona regarding performing bystander CPR and to assess the reasons for being unwilling to perform CPR.

Methods: This was a general population survey using a mailed, self-administered questionnaire. The questionnaire was mailed to random samples of Arizona residents in a rural and urban county.

Results: Usable questionnaires were received from 49.5% ($n = 370$) and 49.6% ($n = 385$) of the samples from the urban and rural county, respectively. More than 50% of respondents reported being willing to perform CPR on a stranger and over 80% reported being willing to perform CPR on a family member. There were no significant differences between the proportions of respondents in each county willing to perform CPR. The reasons for not being willing to perform CPR were relatively evenly divided among the five reasons listed.

Conclusions: Although our findings likely overestimate the proportion of individuals who would perform bystander CPR, the relative importance of the reasons for not performing CPR is informative. Based on the reasons reported, there is potential to change the CPR-related attitudes, beliefs, and skill levels of the general public to enhance the number of people willing and able to perform bystander CPR.

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1. Introduction

Out-of-hospital cardiac arrest (OHCA) remains a significant public health issue in the United States¹ and the industrialized world. A person who has an out-of-hospital cardiac arrest has little chance of survival unless bystanders take immediate action by calling 911 and beginning resuscitation efforts. Numerous studies have provided evidence that the odds of surviving an out-of-hospital cardiac arrest are significantly improved by the provision of bystander cardiopulmonary resuscitation (CPR).^{2–5} Although quite variable, a rough average would be that only about a third of out-of-hospital cardiac arrest victims receive bystander resuscitation prior to the arrival of emergency personnel.^{3,6–10}

Abbreviations: CPR, cardiopulmonary resuscitation; CCC CPR, continuous chest compression cardiopulmonary resuscitation (a.k.a. compression only CPR or “hands-only” CPR); MC, Maricopa County (Arizona); SCC, Santa Cruz County (Arizona).

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Why is this? What are the key barriers to performing bystander CPR? The answers to these questions are far from clear-cut. There are many inconsistencies in the published research literature due to differences in study designs, target populations, data collection methods, and the specific questions asked. For example, Swor et al., among CPR-trained bystanders who had called 911 at the time of a cardiac arrest, found that the most common reason given for why bystanders had not performed CPR was that they had panicked.⁹ Other reasons were concern about not performing CPR properly, physically unable to perform CPR, fear of harming the individual, and belief that the person was dead. Concern about mouth-to-mouth contact was mentioned by only four (1.4%) of the 279 respondents. However, many other researchers have found that mouth-to-mouth contact is an important determinant of the public's willingness to perform bystander CPR, particularly on a stranger.^{11–17} In fact, a number of studies have documented that mouth-to-mouth contact was a significant barrier to initiating CPR by trained health care workers.^{12,18,19} In addition, although not even mentioned in many studies, fear of legal consequences has been reported as a factor making respondents less likely to perform bystander CPR on strangers.^{15,16,20}

The existing literature remains equivocal as to the reasons why members of the general public are not likely to engage in traditional CPR (e.g., a combination of chest compression and mouth-to-mouth ventilation). Hence, in order to inform the development of initiatives aimed at increasing the number of individuals willing and able to perform CPR for out-of-hospital cardiac arrests, we conducted a study to identify the barriers to bystander CPR in the state of Arizona. Specifically, the objectives of this research were (1) to determine the behavioral intentions of the general adult population regarding performing bystander CPR; and (2) to assess the reasons why people in the general population are unwilling to perform bystander CPR.

2. Methods

This study (*Arizona CPR Survey*) was a general population survey that used a mailed, self-administered questionnaire as the data collection tool. The Tailored Design Method developed by Dillman²¹ for survey research guided the survey methodology used in this study.

2.1. Sample

Using residential mailing lists available from a private vendor, 850 names and addresses of residents 18 years of age and older were selected randomly from each of two target subpopulations in Arizona: Maricopa County (MC) and Santa Cruz County (SCC). These two subpopulations were chosen to assure representation of both urban (MC adult population = 2,735,657, including Phoenix) and rural (SCC adult population = 29,294) residents as defined by the Office of Management and Budget. MC represents the largest urban population in the state and SCC is the smallest rural county and it has the highest proportion of Hispanic/Latino residents. This sampling strategy was designed to help ensure that respondents reflected the diversity of Arizona's population. According to Dillman,²¹ the completed sample sizes needed to make population estimates for each of the target subpopulations were 384 for MC and 379 for SCC. These numbers account for maximum population heterogeneity and provide a $\pm 5\%$ sampling error with 95% confidence. In order to obtain those completed sample sizes (i.e., 384 and 379), a sample of 850 from each subpopulation was chosen to account for both undeliverable name/address combinations and non-response. The vendor indicated that no more than 10% of the sample would be undeliverable.

2.2. Data collection form

An eight-item questionnaire was developed specifically for this study (*Appendix A*). It was designed to fulfill the study objectives while fitting on one side of a standard sheet of paper to limit respondent burden. Although the questionnaire items were initially developed by the study team, two early versions of the questionnaire were pre-tested with a total of 17 individuals from the general population prior to completion of the final version. The pre-tests helped to assure that items and response options would be interpreted as intended. The questionnaire has a Flesch-Kincaid grade level of 6.9.

The first part of the questionnaire asked respondents whether they would start traditional CPR on an adult (i.e., stranger, family member) who had experienced a sudden cardiac arrest. We assessed *behavioral intentions*, which are an indicator of readiness to perform a given behavior.²² In this case, the given behavior was bystander CPR. If the respondents reported that they would not start CPR, they were asked why they would not. Five reasons for not performing CPR were provided along with an "Other (please list)" option. To avoid an order effect in the reasons chosen by

respondents, five variants of the questionnaire representing different response orders were printed and distributed equally among the sample. Respondents were asked to check the reasons for not performing CPR that applied to them and to note the one most important reason if more than one were checked. In addition, other questions were included that asked about CPR training, CPR experience, awareness of continuous chest compression (CCC) CPR,^{23–27} training in CCC CPR, age, and sex.

Since over a quarter of the population in Arizona is Hispanic/Latino, all study documents were printed in English on one side and Spanish on the other. The cross-cultural translation process for each document involved two independent forward (English to Spanish) translations and then a reconciled version was prepared by a third professional translator.

2.3. Data collection

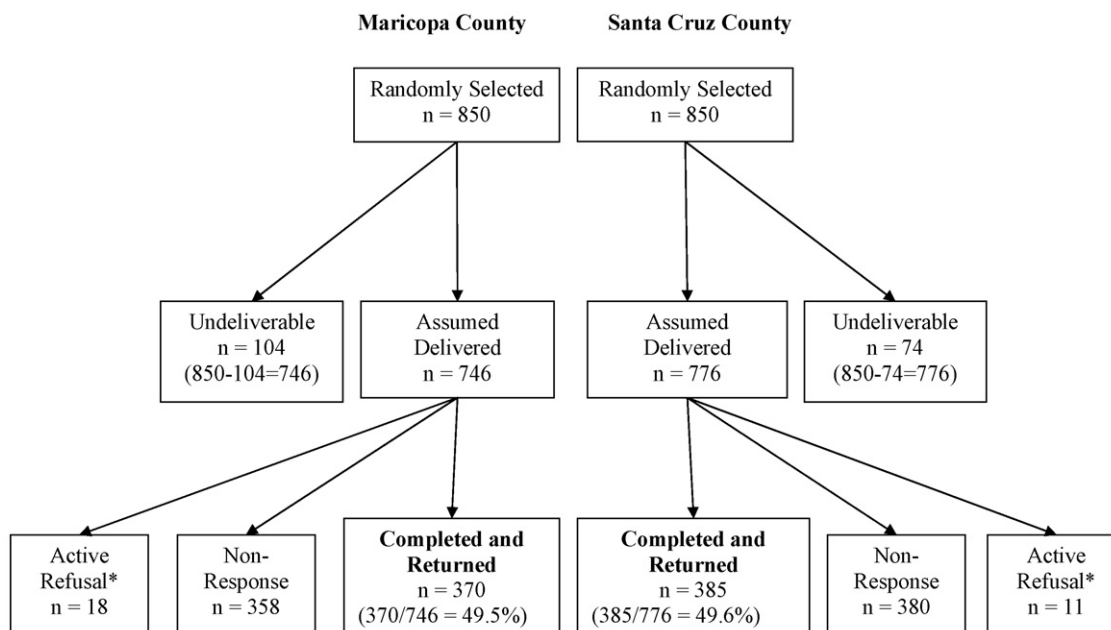
Each potential respondent in the sample received up to four mailings beginning in February 2008. The first mailing on February 12th and 13th was a letter introducing the potential respondents to the *Arizona CPR Survey* and informing them that they had been randomly chosen to receive the study questionnaire within about a week. The second mailing on February 26th and 27th contained a cover letter explaining the study, a disclosure form (in lieu of written informed consent), a questionnaire, a \$2 bill, and a self-addressed, stamped return envelope. The third mailing on March 5th was a postcard sent out 1 week after the questionnaire that served as a "Thank You" to those who had returned the questionnaire and a reminder to those who had not. On March 17th, the fourth mailing was sent to only those who had not returned the initial questionnaire and it contained a cover letter, disclosure form, questionnaire, and a self-addressed, stamped return envelope. All outgoing and return envelopes had affixed postage stamps, which has been shown to increase response rates.²¹ The cover letter asked recipients to return the blank questionnaire in the enclosed stamped envelope if for some reason they preferred not to respond.

A subject identification number was assigned to each member of the sample to enable the tracking of completed responses. While the identification number was entered into the analytical dataset, responses could not be linked to individual respondents. A variable was entered into the dataset to identify the general location of the respondent (i.e., MC vs. SCC). This study was conducted with approval of the University of Arizona Human Subjects Protection Program.

2.4. Data analysis

Descriptive statistics were used to characterize the sample and each of the questionnaire items. Comparisons between urban and rural respondents were conducted to illustrate the population diversity; however, the differences between these two subpopulations were not a primary focus of this study. Difference in mean age between urban and rural respondents was assessed using *t*-test. For the language of questionnaire completion and the source(s) of CPR information, the Wilcoxon Rank-Sum (Mann-Whitney) test was used to determine if there were differences between the two groups. Differences in the frequencies of training, performance, and willingness to perform CPR were assessed using Fisher's exact test.

To compare the frequencies of the most important reason reported for not being willing to perform CPR, chi-square "goodness of fit" tests were run within the "stranger" and "family member" categories. Exploratory logistic regression models were run to identify potential predictors of willingness to perform CPR using age, sex, residence, language of questionnaire completion, and CPR training



* The cover letter asked recipients to return the blank questionnaire if they preferred not to complete it.

Fig. 1. Survey response diagram.

as independent variables. Statistical analyses were conducted with Stata 10.0 (STATA, College Station, Texas, USA). All analyses were performed at an alpha level of 0.05.

3. Results

3.1. Respondents (i.e., completed sample)

Completed and usable questionnaires were received from 370 and 385 respondents from the urban (MC) and rural (SCC) areas,

respectively. Fig. 1 provides a flow diagram for the calculation of the response rates for each of the two target subpopulations. The response rates were remarkably similar (49.5% for MC and 49.6% for SCC). As can be seen, there were substantially more undeliverable addresses in the urban area.

Table 1 provides demographic information and other characteristics for the respondent samples along with proportion of respondents in each county willing to perform bystander CPR on strangers and family members. Although the vast majority (97.6%) of the respondents from MC completed the question-

Table 1
Characteristics of the respondents.

	Urban (n = 370)	Rural (n = 385)	p-value
Response rate	49.5%	49.6%	–
Mean age (S.D.)	52.2 (16.1)	52 (14.9)	0.813 ^a
Median age	51	52	–
Male gender (%)	215 (58.2%)	208 (54.3%)	0.303 ^b
Language of completed questionnaire			
English	361 (97.6%)	279 (72.5%)	<0.0001 ^c
Spanish	9 (2.4%)	98 (25.5%)	
Both	–	8 (2.1%)	
Have had CPR training	228 (63.2%)	210 (55.4%)	0.036 ^b
Have performed CPR in an emergency	27 (7.5%)	39 (10.4%)	0.198 ^b
Have heard about CCC CPR ^d	124 (33.5%)	155 (40.4%)	0.059 ^b
Have had CCC CPR training	27 (7.5%)	44 (11.8%)	0.061 ^b
Source of information regarding CCC CPR			
Television, newspaper, or other media	64 (56.6%)	74 (55.6%)	0.893 ^b
Word-of-mouth	9 (7.8%)	14 (10.5%)	
CPR class	22 (19.5%)	28 (21%)	
Jobsite	18 (15.9%)	17 (12.8%)	
Willing to perform CPR on stranger	190 (51.3%)	210 (55%)	0.342 ^b
Willing to perform CPR on family member	310 (84.5%)	316 (82.5%)	0.492 ^b

^a Two-sample t-test.

^b Fisher's exact test.

^c Mann-Whitney.

^d CCC CPR = continuous chest compression cardiopulmonary resuscitation.

Table 2
Reasons for not being willing to perform CPR.

Most important reason (%) ^a	Rural and urban combined	
	Stranger n = 319	Family n = 116
Fear/concern: harming person	52 (16.3)	26 (22.4)
Fear/concern: performing it improperly	63 (19.7)	30 (25.9)
Fear/concern: legal consequences	72 (21.6)	16 (13.8)
Fear/concern: mouth-to-mouth contact	62 (19.4)	19 (16.4)
Physically unable to perform CPR	70 (21.9)	25 (21.6)
	$\chi^2 = 3.90$ d.f. = 4, $p = 0.419$	$\chi^2 = 5.47$ d.f. = 4, $p = 0.242$
Frequency of all reasons endorsed (% of all mentions) ^b		
Fear/concern: harming person	131 (19.4)	48 (26.4)
Fear/concern: performing it improperly	135 (20.0)	41 (22.5)
Fear/concern: legal consequences	141 (20.9)	22 (12.1)
Fear/concern: mouth-to-mouth contact	123 (18.2)	30 (16.5)
Physically unable to perform CPR	145 (21.5)	41 (22.5)

^a Chi-square goodness of fit test within column.^b No statistical analyses were possible due to the nature of the data.

naire in English, over 25% of the SCC respondents completed it in Spanish. The only other statistically significant difference between the two subpopulations was in CPR training; urban residents were more likely to have had CPR training. However, that did not translate into urban respondents being more willing to perform CPR than rural respondents. More than 50% of all respondents reported being willing to perform CPR on a stranger and more than 80% were willing to perform CPR on a family member.

3.2. Reasons for not being willing to perform traditional CPR

Since there were no statistically significant differences between the urban and rural respondents in terms of proportion willing to perform bystander CPR, the two respondent samples were combined in Table 2. Table 2 provides the frequencies for the reasons given for not being willing to perform bystander CPR on either a stranger or family member. The top half of the table shows the single most important reason given by respondents who were not willing to perform traditional CPR. The Chi-square goodness of fit test for the frequencies reported for each of the most important reasons showed no statistically significant differences within the “Stranger” and “Family” columns. Hence, no one reason can be considered the most important reason overall; however, the size of the respondent sample may have led to insufficient statistical power for this particular analysis.

When all endorsed reasons are displayed in the bottom half of Table 2, the frequencies and proportions of all reasons given for not performing CPR are even more evenly distributed within the “Stranger” column. The distribution of reasons within the “Family member” column shows that some reasons (e.g., “fear of harming person”) were much more frequently reported than others (e.g., “fear of legal consequences”); however, due to the nature of the data (i.e., multiple responses from individual respondents), no tests for statistically significant differences were possible.

When respondents did not answer either “Yes” or “No” to question 1 or 2 (i.e., if they would start CPR on a stranger [Q1] or a family member [Q2]) but selected reasons for not starting CPR, those responses (i.e., reasons) were included in the count totals. In addition, the same decision rule applied to respondents who wrote in “Maybe” or “It depends” instead of checking “Yes” or “No” to question 1 or 2. When respondents selected “Other”

Table 3
Logistic regression analysis of willingness to perform CPR on a stranger^a.

Variable	Odds ratio	S.E.	p-Value	95% confidence interval
Age	0.981	0.005	<0.0001	0.970, 0.991
Sex (male)	Reference			
Sex (female)	0.511	0.086	<0.0001	0.368, 0.709
Urban	Reference			
Rural	1.499	0.267	0.023	1.058, 2.126
Language (English)	Reference			
Language (Spanish)	0.897	0.232	0.676	0.540, 1.490
Language (both)	0.809	0.616	0.780	0.182, 3.601
Had CPR training (yes)	5.052	0.894	<0.0001	3.572, 7.145

^a Hosmer-Lemeshow goodness of fit $\chi^2 = 3.80$, d.f. = 8, $p = 0.8743$.

and wrote in a reason for not performing CPR, most of the 61 written responses were sufficiently close to a listed reason to be added to it (e.g., “fear of contagious disease” and “fear of AIDS” were added to “uncomfortable with mouth-to-mouth contact”).

3.3. Predictors of willingness to perform CPR

Two logistic regression models were run to identify predictors of willingness to perform CPR from among the independent variables assessed (i.e., age, sex, residence, CPR training, and language of questionnaire completion). As shown in Table 3, being younger, being male, having had CPR training, and living in a rural area were predictors of willingness to perform CPR on a stranger (Hosmer-Lemeshow goodness of fit $\chi^2 = 3.80$, d.f. = 8, $p = 0.8743$). As shown in Table 4, when predicting willingness to perform CPR on a family member, the same predictor variables remained significant in the model with the exception of living in a rural area (Hosmer-Lemeshow goodness of fit $\chi^2 = 6.28$, d.f. = 8, $p = 0.6154$).

3.4. Awareness of CCC CPR

Although not aimed at fulfilling one of the primary objectives of this research, we asked respondents if they had heard about CCC CPR prior to completing the questionnaire. Table 1 shows that over a third of the respondents had heard of CCC CPR, primarily through television, newspaper, or other media.

4. Discussion

A substantial number (~45%) of the respondents would not perform CPR on a stranger for a variety of reasons. Although the over 55% of respondents with CPR training were more likely to report

Table 4
Logistic regression analysis of willingness to perform CPR on a family member^a.

Variable	Odds ratio	S.E.	p-Value	95% confidence interval
Age	0.979	0.007	0.003	0.965, 0.992
Sex (male)	Reference			
Sex (female)	0.541	0.123	0.007	0.346, 0.844
Urban	Reference			
Rural	0.894	0.246	0.948	0.603, 1.605
Language (English)	Reference			
Language (Spanish)	0.873	0.267	0.657	0.479, 1.589
Language (both)	0.557	0.515	0.526	0.091, 3.411
Had CPR training (yes)	14.348	4.264	<0.0001	8.014, 25.688

^a Hosmer-Lemeshow goodness of fit $\chi^2 = 6.28$, d.f. = 8, $p = 0.6154$.

being willing to perform CPR, many of them indicated they would not perform it on a stranger. While this unwillingness within the general public may be attributed to a lack of training or a significant lapse of time since being trained, other factors must be considered.

A large number of respondents expressed an unwillingness to perform CPR on a stranger due to fear of legal consequences. Although other studies have reported concern about being sued as a reason for being reluctant to perform CPR,^{15,16,20} this degree of concern regarding legal liability was unanticipated. For example, Johnston et al. found that “fear of legal consequences” as a reason for being less likely to perform bystander CPR was reported by less than 2% of their respondents in Queensland, Australia. However, it may be more of an issue in other, possibly more litigious, countries.^{16,20} Our findings suggest a widespread belief that bystanders are risking personal and financial security when they assist an unknown person in need of CPR.

In addition, numerous respondents expressed fear or concern about not performing CPR properly. This may be due, in part, to a public perception that traditional CPR is complex and therefore difficult to carry out correctly. Rittenberger et al.²⁸ found that the quality of resuscitation efforts decreased with the increasing resuscitation complexity among a sample of paramedic students, which provides evidence supporting the simplification of CPR.

As with fear of legal consequences or concern about properly performing CPR, roughly similar proportions of respondents expressed fear or concern about mouth-to-mouth contact with strangers, likely reflecting a perceived risk of contracting a communicable disease among some respondents. Although these fears are not justified in most cases,²⁹ they may be avoided by CCC CPR since it eliminates the need for mouth-to-mouth contact. And, as mentioned above, reluctance to perform mouth-to-mouth ventilation has been documented as a significant barrier to providing bystander CPR, even among health care providers. Even when mouth-to-mouth ventilation has not been a barrier to initiating CPR, the pause in chest compressions for ventilations is often far longer than recommended, likely leading to worse resuscitation outcomes.^{30,31}

We did not collect data on the proportion of respondents in our sample that would be more likely to perform CCC CPR than traditional CPR. However, our results suggest that the promotion and use of CCC CPR will not reduce or eliminate all of the barriers to performing bystander CPR. In fact, roughly 80% or more of the respondents reported some reason other than concern about mouth-to-mouth contact as the primary reason they were unwilling to perform CPR.

This research is not without limitations. First, we are unable to characterize the non-respondents and the reasons for their non-response are unknown. In addition, our sampling strategy was based on the expectation that less than 10% of the mailing addresses would be undeliverable; however, over 12% of the addresses in the MC sample were undeliverable. This led to a lower than anticipated number of respondents from that portion of the sample. Hence, although the response rate is just under 50%, we did not quite reach the 384 respondents targeted for the urban population. However, the 384 was based on maximum population heterogeneity, which may not have been necessary. For our purposes, we feel confident that the results are sufficiently representative of Arizona residents.

We asked respondents to report their behavioral intentions regarding performing bystander CPR; we did not ask them about actual behavior. Since it is likely that most of the respondents had not been in a situation where bystander CPR was necessary, behavioral intentions is an appropriate proxy. Behavioral intentions are a predictor of actual behavior but, depending on the

specific circumstances, they are not always fully concordant.³² Nevertheless, behavior and behavioral intentions are a function of attitudes and beliefs regarding the behavior (e.g., performing CPR).²² Based on data collected as part of the Save Hearts in Arizona Registry and Education (SHARE) program, Vadenboncoeur et al. found that bystander CPR was performed in 37% of OHCA cases examined in Arizona between November 2004 and April 2006.⁵ Hence, relative to the SHARE program findings, our findings are likely to overestimate the proportion of individuals in Arizona who would actually engage in bystander CPR. However, our research can help inform public health initiatives aimed at changing attitudes and beliefs about performing bystander CPR.

There is no doubt that a portion of the general population is physically unable to perform CPR. In addition, we realize that there are other environmental or situational factors that can impact a bystander's response (e.g., public location of cardiac arrest, presence of other bystanders).³³ Nevertheless, based on the reasons given in this study, there is the potential to change the behavioral intentions of a majority of the respondents who were unwilling to engage in traditional CPR. Steps in that direction include (1) informing the public that mouth-to-mouth ventilation is no longer recommended for OHCA by bystanders not trained in traditional CPR or, if trained, not confident in their ability to perform traditional CPR,³⁴ (2) training the public in the simpler CCC CPR, (3) allaying the public's concerns regarding harming (relative to benefiting) the cardiac arrest victim, and (4) educating the public about the (“Good Samaritan”) laws that protect them from legal liability.

5. Conclusions

These findings demonstrate a need for enhancing the general public's CPR knowledge and skill level as well as changing the public's CPR-related attitudes and beliefs. Our results provide further evidence for the assertion by Vadeboncoeur and colleagues in 2007, that “Public health officials should re-evaluate current models of public education on CPR.”⁵ It is readily apparent that much more could and should be done to increase the number of people willing and able to perform CPR in Arizona and beyond.

Conflict of interest

There are no conflicts of interest to declare.

Role of the funding source

Members of the Sarver Heart Center's Resuscitation Research Group provided input regarding the study design, but had no substantive involvement in the collection, analysis, or interpretation of the study data. The Arizona Department of Health Services Health Crisis Fund had no involvement in any aspect of the study. The funding sources placed no restrictions on the decision to submit the manuscript for publication.

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Appendix A

ARIZONA CPR SURVEY**QUESTIONNAIRE**

After you or someone else has called 911, it is recommended that cardiopulmonary resuscitation (CPR) be started on an adult who has had a cardiac arrest (i.e., the person suddenly collapsed, is non-responsive, and is gasping for air or not breathing). CPR involves a combination of chest compression and mouth-to-mouth breathing.

1. If you saw a **stranger** in this situation, would you start CPR? Yes No

1a. If **No**, please check the box next to the reason why you would not start CPR (check all that apply).

Stranger:

- A. Fear of physically harming the person
 B. Fear of not performing CPR properly
 C. Fear of legal consequences
 D. Uncomfortable with mouth-to-mouth contact
 E. Physically unable to perform CPR
 F. Other (please list) _____

1b. If you checked more than one reason above, please write the letter of the most important reason: _____

2. If you saw a **family member** in this situation, would you start CPR? Yes No

2a. If **No**, please check the box next to the reason why you would not start CPR (check all that apply).

Family member:

- A. Fear of physically harming the person
 B. Fear of not performing CPR properly
 C. Fear of legal consequences
 D. Uncomfortable with mouth-to-mouth contact
 E. Physically unable to perform CPR
 F. Other (please list) _____

2b. If you checked more than one reason above, please write the letter of the most important reason: _____

3. Have you had CPR training? Yes No

4. Have you ever performed CPR in an emergency situation? Yes No

A new type of CPR, called *continuous chest compression* (CCC) CPR has been shown to be as effective as standard CPR in cardiac arrest. CCC CPR involves only continuous chest compression **without mouth-to-mouth breathing**.

5. Had you heard about CCC CPR before reading this questionnaire? Yes No

5a. If **Yes**, what was the source of the information? _____

6. Have you had CCC CPR training? Yes No

7. What year were you born? 19__ __

8. Sex: Female Male

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