

D.5.1.2.

Development of the Heart Safe Cities model

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LB	The current document proposes an action plan for the strategic development and implementation of the Heart Safe City model, including setting all the minimum criteria that a city must meet to be recognized as Heart Safe City.	Project stakeholders Including the project sponsor, senior leadership and the project team

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Project Partners

Role	Partner name	Country
Lead Beneficiary	4th Health District of Macedonia Thrace	Greece
Partner Beneficiary 2	Municipality of Kalamaria	Greece
Partner Beneficiary 3	Institute for prevention, treatment and rehabilitation of cardiovascular disease St.Stefan Ohrid	Republic of North Macedonia
Partner Beneficiary 4	PUBLIC HEALTH INSTITUTION Health Home Ohrid	Republic of North Macedonia

Short presentation of the programme

The Interreg IPA Cross-Border Cooperation Programme CCI 2014 TC 16 I5CB 009 was approved by the European Commission on August 6, 2015 by decision C (2015) 5655. The total budget allocated to the Programme is 45.470.066,00€, out of which 38.649.552,00€ (85%) is Union Support and the 6.820.514,00€ (15%) the National Counterpart. The eligible area of the Programme consists of the NUTS III regions along the border of the two countries: Florina, Pella, Kilkis and Serres, Thessaloniki on the Greek side and Pelagonia, Vardar and Southeast and Southwest from the Republic of North Macedonia. The Programme is built upon the following three Priority Axes: (1) Development and Support of Local Economy, (2) Protection of Environment – Transportation and (3) Technical support.

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1 Introduction

The present deliverable concerns the development of an action plan for the strategic development and implementation of the Heart Safe City model including the definition of all the minimum criteria that a city must meet to be recognized as Heart Safe City.

To develop the action plan, the Contractor has studied similar good practices that exist internationally and have significantly improved survival after cardiac arrest. At the same time, it assessed the actions and methods implemented and identified the procedures that could be applied in the context of this project.

Specifically in the context of this deliverable there is:

- Heart Detailed analysis of the Heart Safe Cities initiative internationally
- Presentation of "Heart Safe Cities" pioneers around the world (good practices)
- Detailed description of the process to be followed for the development and implementation of the "" Heart Safe Cities "model
- Detailed analysis of requirements and compliance criteria to identify a city as "Heart Safe Cities"

2 Analysis of the "Heart Safe Cities" initiative at international level

Cardiovascular disease is a leading cause of global mortality, accounting for almost 17 million deaths annually or 30% of all global mortality while it is estimated that about 40-50% of all cardiovascular deaths are sudden cardiac deaths (SCDs). The survival rate from sudden cardiac arrest is less than 1% worldwide and close to 5% in the US. Prevention of cardiovascular disease by increasing awareness of risk factors such as lack of exercise, inappropriate diet and smoking has reduced cardiovascular mortality over the past few decades, however, there is still a huge cardiovascular disease burden globally. Therefore, there is a need to develop complementary strategies for management of sudden cardiac death.

The "HEARTSafe Communities" Program was designed to promote survival from sudden out-of-hospital cardiac arrest. It is a general idea that focuses on enhancing the 'survival chain' as described by the American Heart Association. It recognizes and intensifies the efforts of individual communities to improve the system of prevention of sudden cardiac arrest (SCA) from becoming irreversible death.

Sudden cardiac arrest is a leading cause of death in the United States and world. Almost 400,000 people annually in the US will suffer out-of-hospital cardiac arrest and most victims die unless HeartSafe program initiatives are implemented and followed. SCA affects any age, any gender and any race. It is characteristic that 50% of people who experience cardiac arrest demonstrate no warning signs in the hours, days, and weeks prior to the event, and only 19% of the symptomatic patients called emergency medical services to report their symptoms. 68.5% of out-of-hospital cardiac arrests occur at home, 21% occurred in public settings and 10.5% occurred in nursing homes. Unlike many other medical conditions, survival from SCA depends on immediate intervention by bystanders or designated first responders on scene; immediately performing at least hands only Cardiopulmonary Resuscitation on the affected person and using an Automated External Defibrillator (AED) as soon as possible. Once a proper HeartSafe program is established, survival rates sky rocket and many lives are saved that previously would have been lost.

It is essential that defibrillation be administered immediately after cardiac arrest. If the heart does not regrow normally within 5-7 minutes, this fibrillation will be fatal. If defibrillated within the first minute of the collapse the patient's chances of survival are approximately 90%. For every minute that defibrillation is delayed, survival decreases by 7-10%. If it is delayed more than 10 minutes, the chances of survival in adults are less than 5%.

In the basic HEARTSafe model, a region sets a set of minimum criteria that must be met in order for its communities to be classified as HEARTSafe. These criteria should be goals that support the survival chain, such as the dissemination of CPR guidelines, public access

defibrillators, and aggressive resuscitation protocols for first responders and hospitals in the area. Individual communities in each region that meet the specified criteria may apply and be designated as a HEARTSafe community. If a community does not meet the minimum criteria, it may take steps to work towards compliance and eventually obtain accreditation. Most programs require re-credentialing of communities every 2 or 3 years (every 3 years in Connecticut). In many areas, towns that are HEARTSafe-designated post signs at roads that enter the town.

Communities achieve the HeartSafe recognition by developing and implementing a community action plan that includes:

- CPR and Automated External Defibrillator (AED) training;
- helping community members recognize the warning signs and symptoms of heart attack & sudden cardiac arrest;
- and activating community members to call emergency care units and use CPR / AED.

Recognized HeartSafe Communities place AEDs in strategic public locations where they are readily available to use in a cardiac emergency and develop a community emergency response plan that furthers the goal of saving lives from cardiac arrest.

The application process for a HeartSafe Community designation includes several steps. This process can take as little as a few months or in some cases, more than a year to accomplish everything. However, a key factor is not only applying and receiving the designation but the effort and plans that your community will put together for ongoing awareness and education about sudden cardiac arrest, CPR training and AED location identification.

The steps for becoming a HeartSafe Community includes:

- STEP 1: Community Buy-In
- STEP 2: Build Your HeartSafe Team
- STEP 3: Identify Community and Fiscal Needs
- STEP 4: Letter of Intent
- STEP 5: Implementation
- STEP 6: Submit Application
- STEP 7: Gain Recognition

The rating of an applying area is done with the use of “heartbeats”. Heartbeats are basically points. Every activity and step that an area identifies or plans have a point value. One point is assigned to every two individuals trained in CPR / AED and five points is assigned to every publically placed AED. The next table summarizes the Heartbeat requirements for an area depending on its population.

Population	Requirements	
< 5.000	350 Heartbeats	A minimum of 80 Heartbeats are required for CPR or CPR / AED training. These requirements include a minimum of 4 new training events and 6 AED sites in public locations.
5.001 – 15.000	450 Heartbeats	A minimum of 120 Heartbeats are required for CPR or CPR / AED training. These requirements include a minimum of 6 new training events and 12 AED sites in public locations
15.001 – 30.000	600 Heartbeats	A minimum of 260 Heartbeats are required for CPR or CPR / AED training. These requirements include a minimum of 10 new training events and 24 AED sites in public locations
30.001 – 50.000	800 Heartbeats	A minimum of 300 Heartbeats are required for CPR or CPR / AED training. These requirements include a minimum of 14 new training events and 48 AED sites in public locations
50.001 – 150.000	1000 Heartbeats	A minimum of 320 Heartbeats are required for CPR or CPR / AED training. These requirements include a minimum of 15 new training events and 100 AED sites in public locations
> 150.000	1500 Heartbeats	A minimum of 360 Heartbeats are required for CPR or CPR / AED training. These requirements include a minimum 20 new training events and 150 AED sites in public locations

(Heartsafe Application Michigan Final Draft, available at <https://www.heart.org/-/media/files/affiliates/mwa/heartsafe-application-final.pdf?la=en&hash=C8F6FE326681AEEE0748FE3835C55CED781F829A>)

3 Presentation of good practices of "Heart Safe Cities"

The first HEARTSafe Program was launched in Massachusetts in 2002. Programs are now available in Arizona, California, Colorado, Connecticut, Kansas, Kentucky, Maine, Michigan, Minnesota, Nevada, New Hampshire, New York, Penn Vancouver, New York, Penn as well as numerous US campuses. The program has also spread internationally in Ireland, New Zealand and Taiwan and is under development in Missouri and Tennessee. Usually, the Programs are administered at the state level through the Ministry of Health or a similar service, and individual communities in each state are designated through this central office. Today there are over 600 local HEARTSafe communities providing a safety net for over 8,000,000 residents.

3.1 Michigan HEARTSafe Program

The Michigan Department of Health, SaveMIHeart and the American Heart Association-Michigan encourage and promote community awareness of the potential for saving the lives of sudden cardiac arrest victims through the use of CPR (cardiopulmonary resuscitation) and increased public access to defibrillation. For this reason they have partnered to promote HEARTSafe Communities. The objectives of their program are:

- Increase public awareness of sudden cardiac arrest and encourage bystander intervention
- Increase the public's access to defibrillators (AEDs) and all public safety and first responders (police, fire, EMS) to also have rapid access to AEDs
- Emergency Medical Dispatch with pre-arrival CPR instruction for bystanders
- Widespread CPR instruction and high-performance CPR
- Supportive cardiac preventive care and support for survivors and families
- Collect and analyze data on out of hospital cardiac arrest utilizing the CARES™ registry (<https://www.heart.org/en/affiliates/michigan-heart-safe-communities-program>)

Towards that direction, the non-profit organization SaveMIHeart was creating uniting the community, first responders, EMS systems, and health systems to improve cardiac arrest survival. Its mission is to double survival by 2020 of patients who sustain a cardiac arrest in the community.

SaveMIHeart utilizes the Cardiac Arrest Registry to Enhance Survival (CARES) to measure and report important cardiac arrest epidemiology, treatment parameters, and outcomes. Also, SaveMIHeart works with communities and health care providers to implement evidence-based solutions that will measurably improve survival. The ultimate goal is to increase the

number of cardiac arrest victims that receive immediate bystander Hands-Only™ CPR and immediate AED use. (<https://www.savemiheart.org/>)

SaveMiHeart has identified the following best practices for enhancing community response to out of hospital cardiac arrest.

- Improving citizen's knowledge and awareness of cardiac arrest, Hands-Only™ CPR and AED
- Training citizens in Hands-Only™ CPR and AED use
- Increasing and improving public access to AED
- Measuring important outcome measures to understand baseline data and to assess success of interventions

The targeted population for the SaveMiHeart project is considered:

- The Average Citizen (general population)
- High risk populations
- Minorities
- Older adults
- High School Students
- Rural communities / high-rise buildings

Among others, the Michigan Department of Health gives special importance to prevention of sudden cardiac death of the young. For that reason it created the Michigan Alliance for Prevention of Sudden Cardiac Death of the Young (MAP-SCDY) a statewide collaborative network that strives to prevent sudden cardiac death of the young by providing leadership, education, and resources to help communities prevent sudden cardiac death of the young.

The Michigan Departments of Health in collaboration with Michigan Alliance for Prevention of Sudden Cardiac Death of the Young (MAP-SCDY) created the MI HEARTSafe School Award Program. The MI HEARTSafe School designation recognizes a school's efforts to prevent sudden cardiac death of the young and preparedness for a cardiac emergency.

To receive a MI HEARTSafe School designation, schools must have:

- A written medical emergency response plan and team.
- Current CPR/AED certification of at least 10 percent of staff and 50 percent of coaches, including 100 percent of head varsity coaches and 100 percent of Physical Education staff.
- Accessible, properly maintained and inspected Automated External Defibrillators (AED) with signs identifying locations.
- Annual cardiac emergency response drills.

- Pre-participation sports screening of all student athletes using the current physical and history form endorsed by MHSAA.

By state law every school in Michigan must have a written cardiac emergency response plan in place. The plans must be reviewed yearly by the staff.

For the school year 2018-19 211 schools have awarded with the MI HEARTSafe School designation. Since the MI HEARTSafe Schools program began in 2013, a total of 569 schools have earned the HEARTSafe recognition for being prepared to respond to cardiac emergencies. The designation lasts for three years. Not all schools which have received the designation have kept it. Today, 490 schools are recognized as HEARTSafe.

3.2 Dubai Heart Safe City Project

The Dubai Heart Safe City Project aims to increase the survival rate of sudden cardiac arrest in Dubai and aims to break the world's benchmark and achieve 65 per cent survival rate by 2020. Presently, globally, the average survival rate of patients with out of hospital sudden cardiac arrest is between 5 to 10 per cent because every minute following a heart attack is crucial and medical help needs to reach the patient within four minutes. Very few cities are exceptions- Copenhagen has a survival rate of 64 per cent while Seattle has a survival rate of 62 per cent.

Dubai Health Authority aims for a healthier and happier community by transforming Dubai into a Heart Safe City for its citizens, residents and visitors. Through this initiative, their strategic plan is aimed towards further saving more than 1500 lives by the year 2025.

Dubai Health Authority has planned to channel its available health, technological and logistical resources while building new capabilities to target the Out-of-Hospital Sudden Cardiac Arrest (OHSCA) population within Dubai. As every second counts in cardiac arrest, the goal is to provide immediate, accessible and quality treatment by the bystanders and first responders before the patient is taken over by the ambulance paramedics and provided definitive treatment at the nearest Health Care facility.

This colossal and altruistic initiative by the Dubai Health Authority is one of the 11 Dubai We Learn projects undertaken by the various Dubai Government entities under the change movement of the Dubai Government Excellence Program, 2019.

Currently, Dubai Health Authority plans to actively involve all the stakeholders and sponsors for maximum participation and rigorous implementation.

One of the biggest challenges that Dubai Health Authority seeks to overcome is the reshuffling and repositioning of current processes and systems to align them with the Dubai Heart Safe City goals and objectives.

Dubai Health Authority is in the planning stage to conduct accredited programs and mass trainings for the general population in life-saving skills like performing Cardiopulmonary Resuscitation (CPR), and educating them about operating the cardiac emergency apparatus called Automated External Defibrillator (AED). Individuals who wish to volunteer when they are an eye witness to OHSCA, or have registered themselves as first responders to provide assistance during such overbearing times is the target population for the training. Dubai Health Authority has set up an interim goal of distributing 3000 AEDs by December 2020, strategically located in major areas, and 7000 by December 2025.

Dubai Health Authority has also goal-posted the construction of a Data Registry for the official tracking of the OHSCA (Out-of-Hospital Sudden Cardiac Arrest) patients, AED trainings, and AED first responders (with their written consent) so that better research and development activities can be undertaken to increase the Survival Rate of Post-Cardiac Arrest from 5% to 20% by the year 2020. For the said purpose, Dubai Health Authority met with the Dubai Corporation for Ambulance Services, and the Dubai Police to discuss the needed balanced approach for the same.

To achieve this, through the ‘You can’t improve what you don’t count’ motto, Dubai Health Authority has started preparation for the OHCA registry by collaborating with the other Dubai government entities and private hospitals. By December 2019, Dubai Health Authority will announce the exact survival rate in Dubai.

In unison with the project objectives, Dubai Health Authority is keen on creating awareness in the general population about OHSCA through social media campaigns and television outreach. Dubai Health Authority also wishes to restructure the interaction networks and team frameworks used within and outside the teams for unambiguous project communication. The following table summarizes the key actions of the Dubai project until 2025.

Table 1: key actions of the Dubai HeartSafe project until 2025

2019: PHASE 1 10 KEY ACTIONS FOR SUCCESSFUL IMPLEMENTATION OF	1. Select program/s to implement
	2. Formulate a team
	3. Determine how to make it happen in your community
	4. Set specific goals
	5. Achieve buy-in from agency personnel
	6. Establish performance standards
	7. Consider a pilot program (DUBAI EXPO 2020)
	8. Communicate progress with all stakeholders

	9. Communicate with the public (to start awareness programmes)
	10. Support, Advocate, Celebrate
2020: PHASE 2 10 STEPS FOR IMPROVING SURVIVAL FROM CARDIAC ARREST	1. Establish a Cardiac Registry 'You can't improve what you don't count'
	2. Begin Telephone CPR
	3. Begin High Performance CPR
	4. Begin Rapid Dispatch
	5. Measure Professional Resuscitation
	6. Begin an AED Program for First Responders
	7. Use Smart Technology to Extend CPR and AED
	8. Make CPR and AED Training Mandatory
	9. Work Towards Accountability
	10. Work Towards a Culture of Excellence
	WILL ALSO INCLUDE:
	1. 50,000 trained individuals
	2. Augment the AEDs available in the community with 3000 deployed devices
	3. Build a network of 50 connected Advanced Ambulances and 10 connected Definitive Care Facilities
	4. Transfer the patient to a definitive care facility with appropriate intervention available
BY 2025: PHASE # 3 (LONG-TERM OUTCOMES)	1. Continuation of PHASE 2
	2. Total trained to be more than 100,000 individuals
	3. Total of 10,000 AEDs to be deployed within the Dubai geographical area.

In April 2018, Dubai Health Authority broke the Guinness World Record for most nationalities in a CPR relay. If this alone seems overwhelming to achieve, in April 2018, DHA's previous Dubai We Learn project was awarded with 7 Stars – Prevention Better Than Cure: Innovation Prevention Program to Combat Diabetes. (<https://blog.bpir.com/latest-news/dubai-we-learn-2019-dubai-heart-safe-city/>)

3.3 Toronto – a Cardiac Safe City

Toronto has been declared as a "Cardiac Safe City" in 1998 and this was the start of a concerted effort to encourage people to learn cardiopulmonary resuscitation (CPR) and how to use automated external defibrillators (AED).

There are approximately 2,000 sudden cardiac arrests every year in the city of Toronto. Many of them happen in public places. That initiative was set up, at the request of city council, to

enable bystanders to assist with resuscitating a patient suffering from a cardiac arrest prior to the arrival of the paramedics.

The Toronto Paramedic Services Safe City Program works with public and private partners to provide quick and easy access to life-saving Automated External Defibrillators throughout the city. Toronto Paramedic Services' Safe City program maintains over 1,500 AEDs in public places like subway stations, police stations, community centres, rinks, pools, and some schools.

The Toronto Paramedic Services Safe City Program offers training in first aid, cardiopulmonary resuscitation (CPR) and how to use an automated external defibrillator (AED) at multiple locations taught by certified instructors. The First Aid programs are WSIB certified while CPR/AED programs follow ILCOR standards. All of the programs teach how to use an AED. The courses that are providing are:

- Emergency First Aid
- Standard First Aid
- Emergency First Responder
- CPR (Cardiopulmonary Resuscitation)
- AED (Automatic External Defibrillator)

Since the inception of the program in 1998, Toronto Paramedic Services has:

- helped place almost 1,600 defibrillators in public locations and private businesses
- run approximately 950 first aid, CPR & AED courses each year
- certified more than 10,000 targeted responders annually, enabling them to use defibrillators and save a life (<https://www.toronto.ca/business-economy/partnerships-sponsorships-donations/partner-2/community-programs/pad-program/>)

4 Roadmap for the development and implementation of the "Heart Safe Cities" model in the cities of Kalamaria and Ohrid

No one is immune to cardiac arrest and it strikes, at any time with no warning. From data across Europe prove that there is need of more actions to be taken in order to achieve a Europe heart safe. In the UK alone 270 children die every year after suffering a cardiac arrest whilst at school. A further 12 fit and healthy young people die of undiagnosed cardiac conditions every week.

Approximately 80% of out-of-hospital cardiac arrests in the UK occur at home, the remaining 20% occur in public places. Unlike a fire extinguisher or first aid kit, there is currently no legal obligation to install a defibrillator. Only 22% of people in EU feel confident in performing CPR on a stranger, providing a lower chance of survival.

The European Resuscitation Council (ERC) reports cardiac arrest is responsible for 20% of all deaths in Europe.

Published in 2016, the EuReCa ONE study aimed to determine the incidence, process and outcome for out-of-hospital cardiac arrests throughout Europe. This international, prospective multi-centre study lasted for one month; patients who suffered a cardiac arrest during October 2014 who were attended to and treated by the emergency services were eligible for inclusion on the study. National, regional and local registries provided the data.

This investigation resulted in data on 10,682 confirmed out-of-hospital cardiac arrests from 248 regions in 27 countries, covering an estimated population of 174 million. In 7,146 (66%) cases, CPR was delivered by a bystander or a member of the Emergency services. 1,735 had ROSC (return of spontaneous circulation) on hospital arrival. Overall 662/6414 (10.3%) in all cases with CPR attempted, survived for a minimum of 30 days or until complete hospital discharge.

This investigation and statistics highlight cardiac arrests are still a major health issue, accounting for a substantial number of deaths across the continent.

Creating healthier and more heart safe cities, countries and Europe can be achievable with simple changes and teaching the next generation life-saving skills from an early age leads to a generation of life savers.

The Chain of Survival and the critical steps to take in the event of Sudden Cardiac Arrest include:

Early Access to Emergency Care

- Bystanders recognize the symptoms of cardiac arrest and call 166 or 112 immediately.

- EMS dispatchers are equipped with instructions for the caller and can get a Basic and Advanced Life Support (BLS / ALS) response vehicles to the scene quickly.

Early CPR

- CPR, when properly administered, buys precious minutes until a defibrillator is available.
- Public knowledge and awareness must be increased so that those trained in CPR will actually perform CPR when it is needed.

Early Defibrillation

- Defibrillation is the delivery of electric shock to restore the heart's normal rhythm.
- Early defibrillation is considered to be the one of the most critical link in the Chain of Survival.
- AEDs are lightweight, sturdy, and easy to use and should be deployed so that a shock can be delivered within three to five (3 – 5) minutes.

Early Advanced Care

- An ALS response vehicle staffed with qualified EMS professionals delivers advanced care in a timely manner.
- Additional therapies delivered by these personnel can be critical to the survival of cardiac patients.

Integrated Post-Cardiac Arrest Care

- A comprehensive, structured, integrated, multidisciplinary system of care should be implemented in a consistent manner

Picture 1: Chain of survival in Sudden Cardiac Arrest



For the development and implementation of a Heart Safe Cities model in the cities of Kalamaria and Ohrid the following Road Map is suggested:

- Stakeholders Implication. Active stakeholder participation in the implementation of Heart Safe Cities model is extremely important. Municipality authorities, Ambulance

Services, NGOs and volunteers, Law Enforcement (police and fire department), educational organizations, sports associations, church, health organizations for primary and secondary care, must engage to the project's idea dissemination in order to have a critically important mass of citizens that will be trained in Cardiopulmonary Resuscitation (CPR) & Automated External Defibrillator (AED). Moreover the above stakeholders can provide resources (human, financial, training locations, AED installation locations etc).

- A lead organization should be designated to oversee the HeartSafe effort involving community organizations and coordinating.
- Cardiopulmonary Resuscitation (CPR) & Automated External Defibrillator (AED) Education is very important in order to increase citizen awareness as responders. Regularly occurring training sessions for CPR and automated external defibrillator (AED) should be conducted in the community. This training improves early recognition of heart attack or sudden cardiac arrest signs & symptoms and allows for more immediate calling of 166 or the designated emergency number 112 and reinforces early CPR and quick use of any nearby automated external defibrillator (AED).
- Law Enforcement Agencies (police, fire department personnel), that usually act as first responders in emergencies, should have trained personnel in Cardiopulmonary Resuscitation (CPR) & Automated External Defibrillator (AED).
- Public access defibrillators (AED). Defibrillators should be placed in public and private locations that are key areas for improving community AED response times, and with public safety and designated first responders (to improve access to early defibrillation while waiting for the Ambulance Services (166) advanced care to arrive.
- Written Emergency Action Plans and community-wide AED protocols should be established, implemented into training, and communicated and reviewed on a regular basis.
- Mapping of AED installation, and ensure that they are all registered with Ambulance Services and connected with applications that citizens can access for free.
- Advanced Care and Ambulance Service Involvement. Advanced care should be engaged (including dispatch 1-6-6 and 1-1-2 centers) in improving survival rates. Advanced care personnel (ambulance Services) that arrive early on scene to assist should be equipped with Advanced Care Life Support equipment (including 12 lead ECG, defibrillators and other monitoring or compression assist devices).
- Advanced care should also be engaged in preventing sudden cardiac arrest, and improving plus evaluating cardiovascular health in the community. This should include access to screenings and counseling for risk reduction or referral to a doctor for follow up care.

- Aggressive resuscitation protocols for first responders and area hospitals.
- Implementation of health promotion programs related to cardiovascular disease in order to inform citizens and raise awareness, to reduce sudden cardiac arrest risk.

5 Requirement Analysis

5.1 Target groups

Target groups for the dissemination of the Heart Safe Cities Model in Kalamaria and Ohrid include all the possible categories of citizens and authorities of both municipalities. It is of high importance to disseminate the importance of the project's idea in order to raise awareness and stimulate citizens involvement.

In more detail target groups must include:

- NGOs and volunteers
- Schools and education organisations (public and private)
- Sports Clubs and Associations
- Law Enforcement (police and fire department)
- Church and religious organizations
- Business Chambers and Associations
- Health Organisations for primary and secondary health
- Municipality Authorities

All organisations that participate in the economical and social life aspects in both cities must be targeted in order to attract as much citizens as possible, that will participate in training activities and will form the necessary human core that will implement Heart Safe Cities Model.

5.2 Determination of particular significance spaces and spaces that accommodate high-risk groups for cardiac arrest

Public access AED programmes should be actively implemented in public places with a high density and movement of people such as

- airports,
- railway stations,
- bus terminals
- sport facilities and stadiums
- shopping malls centres
- offices,
- theatres
- banks
- open spaces like squares or parks

where cardiac arrests are frequently witnessed and trained CPR providers can quickly be on scene. Moreover population density at municipality level must be taken into account in the process of defibrillators emplacement.

AEDs should also be provided in remote locations where an emergency ambulance response would be likely to be delayed.

The potential benefits of AEDs being placed in schools as a method to raise awareness and familiarity with this lifesaving equipment is highlighted as good practice in many EU countries. Registration of defibrillators with the local ambulance services is highly desirable so that dispatchers can direct CPR providers to the nearest AED.

When implementing an AED programme, community and programme leaders should consider factors such as the development of a team with responsibility for monitoring and maintaining the devices, training and retraining individuals who are likely to use the AED, and identification of a group of volunteer individuals who are committed to using the AED in victims of cardiac arrest. Funds must be allocated on a permanent basis to maintain the programme.

More specifically the following guidelines should be followed for AED installation:

- AEDs should be located in a clearly marked, brightly, illuminated and unobstructed location. Professional signage, with icons should clearly mark AED locations and direct users to the device. Ideally rescuers and responders should be able to assist the victims of a Sudden Cardiac Arrest in less than 2 to 3 minutes and directional sites should be located in high visibility public buildings and businesses and at social or athletic events.
- AEDs should be easy to reach and remove with one hand.
- AEDs should be readily accessible to all employees of the building and to the public and should be within reach of wheelchair-bound individuals. The AED cabinet should be mounted in an unobstructed area, 112 cm above the floor, to ensure that anyone can access it in the event of an emergency. The maximum side reach for an unobstructed approach to an AED is 137cm.
- For maximum efficacy, be sure to train key personnel throughout the buildings that accommodate an AED, in how to properly use it.
- Equipment should be regularly inspected for signs of tampering and to make sure it's emergency-ready.
- Consider placing non-latex protective gloves, if not included in the AED, CPR face masks, scissors, safety razors (to shave the victim's chest hair, as necessary), absorbent towels, and a first aid kit near your AED.

5.3 Availability of pre-hospital medical care in the area

Although bystanders who witness an OHCA are key to providing early access, CPR, and defibrillation—the first links in the chain of survival and the links that are most strongly associated with improved outcomes high performing pre-hospital services are as well important for the patients survival.

It is important cities that want to implement Heart Safe cities model to have Ambulance Services or Emergency Medical Services (EMS) with enhanced capabilities. Moreover of critical importance is the time elapsing from information for a SCA to EMS or Ambulance Service to arrival at the scene. It is important pre-hospital medical care in the area to be planed based on population density, and the information of activities that can attract visitors. The elapsing time between reporting and arriving on scene should ideally be less than 5 minutes.

All ambulances must be well equipped for treating OHCA including 12 lead ECG, defibrillators and other monitoring or compression assist devices, and staffed with qualified and trained EMS professionals

Finally EMS and Ambulance Service must establishing a standardized definition and training curriculum for high-performance CPR to be used in basic emergency medical technician training and certification.

5.4 Medical care structures

Medical care structures like hospitals are important in the chain of patient survival because they provide post arrest treatment.

To improve survival from SCA, patients should be transported to hospitals that provide a comprehensive, structured, integrated, multidisciplinary system of post-cardiac arrest care. Treatment should include cardiopulmonary and neurological support including therapeutic hypothermia and percutaneous coronary interventions. Most hospitals offering this type of care are located within the metropolitan areas while patients from smaller communities or rural areas will have EMS or ambulance services that transport directly or transfer after patient stabilization.

There is considerable variation in the treatment, care delivery, and outcomes across hospitals post-arrest care. The majority of hospitals do not monitor patient outcome following cardiac arrest nor do they publicly report standard measures of cardiac arrest survival to discharge and neurological outcomes. Monitoring and recording of the above elements is important in reviewing and re-planning strategies to improve patient survival after Sudden Cardiac Arrest. Every hospital that treats cardiac arrest patients should be capable of analyzing its outcomes, protocols, training, and performance.

5.5 Statistics on cardiac arrest

Sudden out of Hospital Cardiac Arrest is the third leading cause of death in industrialised nations. In Europe, more than 350,000 patients are affected every year. And 100.000 could be saved if lay resuscitation – giving chest-compressions immediately and before arrival of the emergency medical services (EMS) – was improved all over Europe.

ERC published in 2016, the EuReCa ONE study aimed to determine the incidence, process and outcome for out-of-hospital cardiac arrests throughout Europe. Data on 10.682 confirmed Out of Hospital Cardiac Arrest (OHCA) incidents were collected from 248 different regions from 27 EU countries. In 7.146 cases CPR was started by a bystander or EMS. The study showed that the incidence of OHCA rate of 84 cases per 100.000 of population. The incidence of CPR attempts ranged among the participating countries from 19 to 104 per 100.000 per year.

Mean patient age was 66,5 years and the median age was 70 years. The majority of patients were men (66,3%). The majority of OHCA (69,4%) occurred in private residence. In 54,3% of cases the collapse was noticed by bystanders and 12% by EMS. In almost half of the cases (47,4%) of cases CPR was initiated by a bystander. A shockable initial cardiac rhythm was reported in 22,2% of patients, ranging from 4.4 to 50%.

Data on Return of Spontaneous Circulation (ROSC) at any stage were available for 6.963 of 7.146 patients (97,4%) from whom a resuscitation attempt was started. From these patients 4.409 died on scene or en route to hospital (64%). One fourth of the patients (n=1.735) had sustained ROSC on arrival at the Emergency Department of the Hospital and 740 patients (10,7%) arrived with on going CPR. Of the patients with ROSC, 42% survived. Of the patients with on going CPR 5% survived. Data on patient survival (for patients received CPR and were transferred successfully to hospitals) differ among the participating countries from 6,4% to 66,7%. The above numbers if extrapolated to European population show that almost 29.000 people in Europe are successfully resuscitated each year after an out of Hospital Cardiac Arrest (OHCA) incident.

Differences in EMS structure and preparedness and willingness and knowledge of bystanders to provide CPR is the reason for the differences in the reported data in this study.

Despite these limitations, some epidemiological trends have been observed, and factors correlated with incidence and survival have been identified. For example, reducing the time between collapse and initiation of cardiopulmonary resuscitation (CPR) and defibrillation has been significantly associated with better survival rates and improved outcomes. The available data can help identify geographic variation in cardiac arrest outcomes, and wide regional variation has been identified. While patient characteristics such as race and gender have been

associated with disparities in outcomes, these factors cannot explain the wide variations that have been observed, thus pointing to concerns about access and quality of care.

Holding EMS and health care systems accountable for performance first requires improving the state of data collection, reporting, and analysis across the cardiac arrest field. Several key areas have been identified for action related to data collection and dissemination, including the development of a national cardiac arrest registry, standardization of terms used to measure patient treatment and outcomes, and identification of performance metrics that should be measured and recorded for all cardiac arrest patients.

Key Research Opportunities on statistics include:

- Measurement of the incidence and the quality of outcomes for cardiac arrests occurring inside and outside the hospital, and determine the impact of factors such as gender, race, socioeconomic status, age, medical history, and location of arrest on cardiac arrest incidence, treatment, and survival.
- Research strategies to enhance the utility of existing cardiac arrest registries by improving the quality of data through the use of standardized definitions and outcome measures, engaging more EMS and hospital systems in data-collection efforts, enabling and enforcing transparent and accountable health care systems, consolidating and harmonizing data repositories, and investigating new ways to leverage registry data to improve cardiac arrest treatment.

Other opportunities that should be considered include

- Definition of the nature and scope of the public health burden of cardiac arrest for at-risk or underserved populations, including minorities, women, children, and those living in rural areas. Subsequent research that is tailored to the unique needs of these populations as revealed by surveillance data.
- Determination of how evidence-based strategies for improving outcomes can be adapted to the needs, limitations, strengths, and capabilities of particular health care systems.
- Identification of the factors associated with high- and low-performing systems in order to develop best practice guidelines for health care systems.
- Basic science research on causes of cardiac arrest with an emphasis on the genetic, behavioral, environmental, and other factors associated with cardiac arrest.
- Provision of an objective basis for performance standards by identifying and mapping the correlations between the context and characteristics of a treatment and the quality of subsequent outcomes.

5.6 Requirements and compliance criteria for a city to be recognized as a "Heart Safe"

The following minimum requirements and compliance criteria are suggested in order to have a city recognised as a Heart Safe:

- A lead organization (e.g. fire, police, board of health) should be designated to oversee the Heart Safe effort involving community organizations (e.g., businesses, NGOs, schools, churches) and coordinating. It is preferable to be a health associated organisation.
- Local authorities responsible for dispatching police, fire department, that can act as first responders have personnel trained in Basic Life Support and the use of AED.
- A minimum of 5% of the community population should be trained in the last 36 months in CPR and AED use. All forms of training are acceptable including hands-only CPR, certification training at any level and views of approved ultra-brief instructional videos.
- The municipality must plan to train at least 1% of their population each year.
- Permanent placement of AEDs in public or private locations where many people congregate or may be at higher risk for cardiac arrest such as shopping malls, supermarkets, theatres, health clubs, parks, recreational centres, transportation centres and other appropriate venues. AEDs placed at athletic fields, parks, beaches and public gathering spots should be accessible on a 24/7 basis whenever possible.
- AED locations must be mapped and integrated with your 166 or 112 system.
- The communities must develop and implement strategies to increase public awareness of sudden cardiac arrest and encourage bystander intervention. Examples include public demonstrations with hands-on practice, improving access to certification courses, utilization of social media and ultra-brief instructional videos, billboards, newspaper articles and other innovations.
- Communities must establish secondary public health measures supporting cardiovascular wellness, such as education, prevention, and systems of care for stroke and myocardial infarction.
- Communities must record data concerning Sudden Cardiac Arrest and analyze them in order to continuously review their strategies.
- The local Ambulance Services or Emergency Medical Services (EMS) provides and practices "high-performance" CPR and has supportive protocols, technology and equipment for resuscitation and effective post-resuscitation care. Medications and oxygen therapy delivered by paramedics can be critical to the survival of cardiac arrest victims.
- Communities should have in a range of 40km hospitals or other primary or secondary health structures that can provide a comprehensive, structured, integrated,

multidisciplinary system of post-cardiac arrest care. Treatment should include cardiopulmonary and neurologic support including therapeutic hypothermia and percutaneous coronary interventions.

6 Communication strategy for the development of the "Heart Safe Cities" model

Improving survival after cardiac arrest requires major changes in attitudes and cannot be achieved without the commitment of other organizations and institutions. The basic strategy for the development of the "Heart Safe Cities" model aims to enhance / increase the participation of the population, especially the young, which will ensure the sustainability of the project. This can only be done if they understand that this particular model is what gives themselves and their loved ones the best chance of survival after cardiac arrest. The second thought that people need to understand is that this "safety net" that this particular model can create can be lost if they go beyond their city limits.

The communication strategy of the "Heart Safe Cities" model has two parts:

- Information on the "Heart Safe Cities" program and model and the benefits to the local community
- Attracting stakeholders to be trained in resuscitation, first aid and CPR practices so that they can function decisively during an incident and save a life

The target groups of the communication strategy are:

- The general public
- Health professionals
- Emergency services such as police, fire brigades etc.
- Social services
- Young people
- Civil servants
- Collective bodies

The communication strategy for promoting the model, raising awareness and mobilizing citizens is suggested to include the following:

1. Short online videos both informative and educational
2. Use of Mass Media
 - a. Sending articles and press releases to local and thematic newspapers
 - b. Informing Mass Media to cover health-related events, CSRs, trainings etc.
3. Using social media such as Facebook, Instagram, Twitter which could mobilize mainly young people who are their main users
 - a. Regular posts about community benefits from adopting the model
 - b. Postings about upcoming events and trainings
 - c. Case reports
 - d. Advice on heart health

4. Encouraging important personalities such as athletes, politicians, actors to become involved with the program and to be trained in CPR and defibrillation procedures to become a role model for the general public.
5. Organizing events
 - a. Organizing demonstrations in crowded places such as squares, shopping malls
 - b. Organizing information events in high schools and sports centers
6. Creation of information leaflets and distribution through public services, hospitals, service centers etc.
7. Placing information signs at high crossing points eg bus stops, public services, squares etc.

7 Bibliography

- Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, et al. Executive Summary: Heart Disease and Stroke Statistics-2016 Update: A Report From the American Heart Association. *Circulation*. 2016; 133:447.
- Lloyd-Jones D, Adams RJ, Brown TM, Carnethon M, Dai S, De Simone G, et al. Executive summary: heart disease and stroke statistics--2010 update: a report from the American Heart Association. *Circulation*. 121:948–54.
- Mensah GA, Mokdad AH, Ford ES, Greenlund KJ, Croft JB. State of Disparities in Cardiovascular Health in the United States. *Circulation*. 2005; 111:1233–1241.
- Forsyth A, Oakes JM, Schmitz KH, Hearst M. Does Residential Density Increase Walking and Other Physical Activity? *Urban Stud*. 2007; 44:679–697.
- Havranek EP, Mujahid MS, Barr DA, Blair IV, Cohen MS, Cruz-Flores S, et al. Social determinants of risk and outcomes for cardiovascular disease a scientific statement from the American Heart Association. *Circulation*. 2015; 132:873–898.
- Lloyd-Jones DM, Hong Y, Labarthe D, Mozaffarian D, Appel LJ, Van Horn L, et al. Defining and setting national goals for cardiovascular health promotion and disease reduction the American Heart Association's Strategic Impact Goal through 2020 and beyond. *Circulation*. 2010; 121:586–613.
- Diez-Roux AV. Bringing context back into epidemiology: variables and fallacies in multilevel analysis. *Am J Public Health*. 1998; 88:216–222.
- Marmot M. Social determinants of health inequalities. *The Lancet*. 2005; 365:1099–1104.
- Rose G. Sick individuals and sick populations. *Int J Epidemiol*. 2001; 30:427–432.
- World Health Organization UN Habitat. Global report on urban health: equitable, healthier cities for sustainable development. World Health Organization, 2016.
- New Hampshire Heart Safe, New Hampshire Department of Safety. <https://www.nh.gov/safety/divisions/fstems/ems/documents/HeartSafe>
- Michigan Heart Safe Communities Program <https://www.heart.org/en/affiliates/michigan-heart-safe-communities-program>
- Dubai We Learn, 2019 – Dubai Heart Safe City <https://blog.bpir.com/latest-news/dubai-we-learn-2019-dubai-heart-safe-city/>
- Making Toronto a Cardiac Safe City <https://www.toronto.ca/business-economy/partnerships-sponsorships-donations/partner-2/community-programs/pad-program/>
- Heartsafe Application Michigan Final Draft, available at <https://www.heart.org/-/media/files/affiliates/mwa/heartsafe-application-final.pdf?la=en&hash=C8F6FE326681AEEE0748FE3835C55CED781F829A>
- <https://www.michigan.gov/mdhhs/0,5885,7-339--479692--,00.html>

- <https://heartsafefoundation.org/index>
- https://35d4c000-34ac-4ec9-9268-dc25721ef13f.filesusr.com/ugd/52cbb3_76c9ab0469534c07a9a79fc5a47d89a5.pdf