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**One emergency number, a study of advantages
and disadvantages**

<i>Tittel (norsk): Ett felles nødnummer, en studie av fordeler og ulemper</i>	<i>Dato: 23.05.14</i>
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Sammendrag: En studie av fordeler og ulemper knyttet til ett nødnummer, med fokus på Norge og den pågående debatten om hvorvidt man skal endre nødmeldetjenesten fra dagens tre forskjellige, til ett felles nødnummer.

Abstract: A study of the advantages and disadvantages regarding one emergency number, focusing on Norway and the ongoing debate of whether one should change the emergency call service from today's three numbers to just one.

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1. Introduction

Today, Norway have three emergency numbers. 110 for fire and rescue services, 112 for police, and 113 for medical emergencies (Andersen *et al.*, 2009, p.7). Each number is operated by different emergency centrals located separately. There is a debate in Norway whether there is a need to change from today's system to one number, making it easier for the general public to know where to call and also promote better cooperation between the emergency services. This would require a significant change in how the emergency centrals are run today.

EU have made 112 the standard emergency number in all its member states, and preferably the only one. When someone dials an emergency number, they are opening the gateway to all available public and private resources to preserve and rescue human lives, stop or limit environmental damage and limit the damage on major material assets. In certain cases, life and death hangs in the balance as the operator receiving the call must act correctly and respond with the proper resources. It is in everyone's interest to have the most efficient system possible to stand on the front line from everyday accidents and medical emergencies to the disasters that change society as we know it.

My goal is to shed more light on what the advantages and disadvantages are concerning one emergency number. The subject for this thesis is highly relevant in the ongoing debate, which may or may not result in major changes in how the Norwegian emergency call service is organized.

The main focus is to look at whether this model would be better for the Norwegian emergency services. Based on the available reports, studies and recommendations on the subject, I will look into how one emergency number affects the handling of emergency situations. I will look at other countries that have this system today, and what results have been there. The opponents of 112 as the only emergency number have voiced their concerns. I will look into their warnings and see what disadvantages there may be. Finally, I will study actual incidents in Norway where the different emergency centrals were not able to cooperate properly, with serious consequences. By comparing the theoretical advantages and disadvantages against the actual results from the empirical data, the aim is to be able to say something about what is the best solution for the

emergency call service. There will be emphasis on the empiric results based on incidents occurred.

The focus will be on one emergency number as a common platform for all emergency calls coming in from the general public. I do not lay down limits for who and how the operators are organized and do this job, for example one big emergency central or divided command centrals that get calls routed in depending on the nature of the callers emergency. There are many ways to do this, and it is done in many different ways around the world. All of these different systems are worth examining, and that is why I wish to include everything, and not exclude certain systems based on predetermined requirements.

Today's system of three different numbers, run by various organizations, means that all the centrals for each number are governed by different laws, instructions and sorting under various governmental sectors. I will not do an in-depth discussion on how these laws and instructions might cause problems with the possibility of only one emergency number. If one decides to go for one number, the laws must be altered accordingly to create a solution that works. Again, the focus is one number as a common platform for handling emergency calls. Referencing is done using the Harvard system.

2. Research methodology

The methodology I've used for my research is mainly qualitative analysis of documents. I found the material using search engines like Google scholar and BIBSYS, and also by contacting the Norwegian Ministry of Justice and Public Safety. The design I have chosen is an extensive one. This means to have a broad approach and try to get as many units as possible in the data processed. The reason for this choice is also to increase the chance of being able to generalize the findings from other countries/systems, as it is the objective of this thesis (Jacobsen, 2000, p.80).

Advantages of the qualitative analysis, is that there are no limits as to what kind of information is collected. This opens up for new information during the course of collecting and analyzing data, and does not rule out anything based on predetermined parameters. For disadvantages it is very work-demanding to analyze material when

there are no limits to what might be relevant. The data in itself could be very unstructured and demanding to work with (Jacobsen, 2000, p.115–117).

I have chosen this method because the subject that I am researching is too big to be based on just a few units and their view and/or experience of how things work. In order to be able to say something about how a system of one emergency number would work for better or worse in Norway, I have to look at the big picture.

3. Theory

3.1 The foundation for the Norwegian safety and readiness system

Before we look at the emergency numbers in particular, it is important to be aware of the pillars the Norwegian safety and readiness system is built upon. These four basic principles are the foundations for all public and private actors that in some way have responsibilities within the fields of safety and readiness. That is why it is important to keep them in mind when discussing alternatives for future handling of emergency calls.

The first is called the principle of responsibility. Whoever is responsible for a certain field in a «normal» situation, also have responsibilities in an emergency within that field.

The second is the principle of equality states that the organization one runs at a daily basis, should to the extent possible be equal organizational-wise (or at least recognizable) in an emergency.

The third one is called the principle of proximity. All emergencies should be handled at the lowest level possible, gaining proximity to the incident (Politidirektoratet, 2011, p.26).

The fourth is the principle of cooperation and interaction. It was introduced by the government after the terrorist attacks on July 22, 2011. It puts in place a responsibility on everyone with a role concerning safety and readiness, to independently ensure cooperation and interaction with any and all relevant partners (Justis- og beredskapsdepartementet, 2012, p.39).

3.2 The Norwegian emergency call service today

As mentioned earlier, there are three different emergency numbers in use today. 110 is for fire and rescue services. It is operated by the fire departments, and is a municipal responsibility. 112 is for the police who have their operations centrals spread out across the country. And finally 113 is for medical emergencies, sorting under the health authorities. In total there are more than 60 emergency centrals spread across the country. They receive calls and coordinate the resources that sort under the different services independently (Andersen *et al.*, 2009, Chapter 5).

To ensure efficient cooperation between the different centrals, they are to make sure a triple alert is done whenever necessary. The 11x central that gets the first call is responsible for executing the triple alert. This means alerting all three emergency centrals about the incident, so that all the emergency services can respond with the necessary resources. (Direktoratet for samfunnssikkerhet og beredskap *et al.*, 2013, p.10).

3.3 The development of emergency numbers in Norway and the EU

Historically, the first proper emergency number system in Norway was up and running in 1987. The numbers at the time were 001 for fire, 002 for police and 003 for medical emergencies. But because of the birth of 112 as the common EU-emergency number in 1991, Norway changed its number-series from 00x to 11x in 1994. This is the system still used today with 110 for fire service, 112 for police and 113 for medical emergencies (Justis- og politidepartementet, 2004, p.8). Norway is not a member of the EU, but it is part of the European Economic Area (EEA), and through this membership affected by EU legislation. The requirement that all EU and EEA states have 112 as an emergency number available, are written in directive 2002/22/EC. This directive states that 112 must be reached free of charge and regardless of service provider, including public payphones. It also focuses on the fact that the citizens of the member states must be properly informed about 112 as the common European emergency number (European Parliament and the Council of the European Union, 2002). The idea is that all citizens should feel safe that wherever they are in the EU/EEA they can call the same number

(112) to get help in an emergency. However, the directive did not say the 112 had to be the only emergency number, just as long as it was available, and able to cross-connect with other appropriate services. That is why Norway chose to stick to three different numbers when taking up 112 in 1994 (Justis- og politidepartementet, 2004, p.20). Also in many EU countries 112 exist besides other emergency numbers, but as of 2013 a total of 7 member states use 112 as the main number to contact all emergency services (European Commission, 2013, p.3).

3.4 112 as the only emergency number in Norway

3.4.1 The FENN-report

FENN is short for “forenkling og effektivisering av nødmeldetjenesten”. Roughly translated it means “simplifying and streamlining the emergency call service”. In 2004 this report was published recommending using only one emergency number as the future for the Norwegian emergency call service. After a lengthy process, the results from analyzing the whole system of reporting accidents and dispatching emergency services accordingly were written. This was the first real attempt to look at the whole emergency call service. The objective was to see if there was room for improvement in effectiveness and coordination in the emergency call service in Norway. The report had four main recommendations:

- 112 as the only emergency number, and organized as a whole or partly in one common service. This to improve cooperation and coordination. In part this was also due to development in other western countries, mainly in the EU, that increasingly were adopting 112 as the only number.
- Gathering the emergency call service inside one organization, to aid cooperation and make proper use of all available resources.
- It also recommended one organizational interface, standardizing technical solutions and contact points for external actors.
- Finally, it was recommended to reduce the overall number of centrals to cover larger parts of the populations for each central (Justis- og politidepartementet, 2004, p.2–3).

3.4.2 Interdepartmental work group report

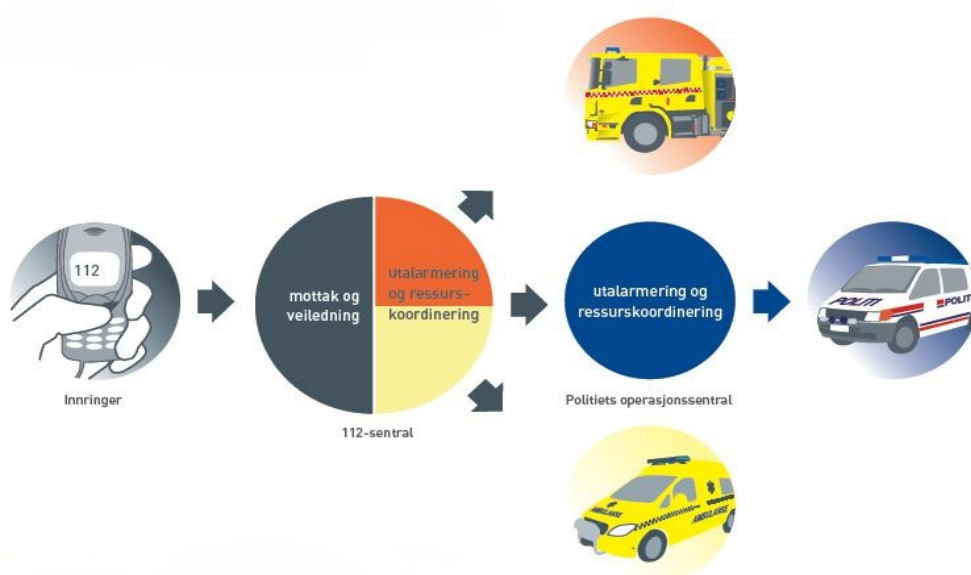
The Norwegian government stated in a white paper in 2008 that it intended to introduce 112 as the only emergency number. An interdepartmental group was established with a mission to study alternatives for the future organization of the emergency call centers (Justis- og politidepartementet, 2008, p.68). A year later, this report was published. Again, the recommendation was to go for 112 as the only emergency number (Andersen *et al.*, 2009, p.8). The reason for this recommendation was an improvement from today's system where the emergency services are split by what they do, but also sometimes geographical boundaries that do not follow the same lines. This makes cooperation and coordination difficult. With one central having responsibility for one geographical area, and one operator being able to keep track of an operation over time, better use of emergency resources should be the result. The aim is to ensure that every resource that is needed, is dispatched to an accident site. The proposed model would also have a better oversight of available resources in all the emergency services, which is not the case today (Andersen *et al.*, 2009, p.7–8).

What they found when reviewing today's system, is that it works well for the most part. But there were identified challenges. The large number of centrals in total result in the smaller centrals encountering problems when large or complex incidents occur. They simply do not get that much experience that the operators on a larger central does. If a caller use the wrong 11x number, the operators do not have sufficient knowledge on how to guide the caller. Lack of knowledge is also a problem concerning the awareness of the other emergency services and their resources, and also how and if they should be involved. The result being in some cases that rescue efforts are delayed unnecessary. This becomes a problem in complex incidents that involve more than one of the emergency services (Andersen *et al.*, 2009, p.52–53).

This report also considered how one should organize the emergency services around the new 112 number. Four different alternatives were presented. Model A involved setting up a new 112 central that received all calls, and then forwarded them to the appropriate emergency central. The three emergency services' own central would remain as they are today. Model B had one 112 central that also dispatched the fire/rescue resources, with

the other two emergency services keeping their own centrals. Model C is the preferred model and is explained in detail below. Model D meant removing all of today's emergency centrals and setting everything up in a new 112 central. This central would receive calls, dispatch and coordinate all of the emergency services (Andersen *et al.*, 2009, p. 98-104)

The model C that was preferred by the interdepartmental group involved one contact point for all incoming calls. Dispatching and coordination of the fire/rescue service and medical emergencies would also be handled by the 112-central. The police would retain their command centrals and exercise command and control like they do today. The 112-central would route calls to the police when necessary. The reason for this choice was the need for fire/rescue and emergency medical dispatchers to be located in the same place. Since these are the two most important resources to get out in the field as soon as possible to save lives, they are a fully integrated part of the proposed 112-central. Today's 110 and 113 only coordinate resources, while the police 112 exercise command. Also because they sometimes have the need of doing certain operations covertly that fire/rescue and medical dispatchers do not need to know about. Therefore they recommended to continue with their own command centrals (Andersen *et al.*, 2009, p.105).



(Picture: Andersen et al., 2009, p.102)

3.5 Access time

Access time is the time it takes from a caller dials an emergency number until he or she gets access to the emergency operator. When someone calls an emergency number, they would want to be answered as quickly as possible. For later reference, it is important that some sort of baseline is laid down concerning what access time is acceptable. In Norway, there is no national standard for how long the access time at most should be for all the emergency numbers. This is probably due to the fact that the different centrals are run by different organizations. But there are some requirements, at least for the medical emergency centrals.

The health authorities have put in place a requirement for all the medical emergency centrals, 113. This requirement states that 90% of all calls should be answered within 10 seconds. It was recommended in a report from 2009 (Rygh Pedersen *et al.*, 2009, p.101), and later established firmly by the Norwegian Board of Health Supervision when reviewing the medical emergency central for Oslo and Akershus in 2013 (Helsetilsynet, 2013).

In Sweden, where the emergency centrals are run by SOS Alarm, there is a requirement in the contract with Swedish authorities that the access time should be 8 seconds (Andersen *et al.*, 2009, p.68). For Finland, the requirement is that the calls to the emergency central is answered within 12 seconds (Andersen *et al.*, 2009, p.73).

4. Empirical data

In this chapter, empirical data will be presented. First I will present findings from several reports and studies on the subject. The systems for emergency call services in other countries will be presented, as well as the most important counter-arguments about why today's system should be left the way it is. After that I will look at some real incidents that have occurred in Norway that pointed out flaws in today's system, before finishing off the chapter with some statistics on access time.

4.1 Emergency centrals in the UK, Ireland and the USA

The Norwegian Association for Fire Brigade commanders/officers have funded two trips where members have visited the USA and later the UK & Ireland to study how

they handle their emergency centrals. Representing the fire and rescue services, they had their focus primarily on the fire and rescue services in the places they went. I will present their findings.

The first visit was made to the United States in 2010, where 5 different cities and centrals were visited: Los Angeles, Phoenix, San Francisco, Chicago and New York. There were differences from central to central as to how they were organized and who the emergency central sorted under. Sometimes it was the fire department like in Los Angeles, in other cities it is run by the police (New York), and some have made a new organization just for the emergency central (Chicago). This is due to the lack of national guidelines and standards. Every state/county/city have a large degree of self-governing, and must figure it out on their own. In the United States, 911 is the national emergency number, after being standardized by law in 1999 (Sivertsen and Aakerman, 2010, p.20). The 911 calls are almost always handled by some sort of police department. This could be local police, Highway Patrol, and so on. However, they merely connect the caller to the appropriate central, unless it is police/criminal business. Because of this, the visit decided to mostly focus on the centrals that coordinated and dispatched fire/rescue and medical resources. It is important to mention that both fire/rescue resources as well as ambulances/medical emergency resources, are organized in the fire department many places in the US. In those centrals, the operators were organized as call takers and dispatchers. The call taker would gather information on the person in need that is calling, what kind of incident, address and so on. The dispatcher focuses on sending out the right resources based on the information provided by the call taker.

A critical factor for success, as identified by the authors, were the presence of officers/commanders in the emergency centrals. These officers or commanders decided how to prioritize resources when large incidents occurred, or several incidents at the same time. This also involved moving around resources (fleet management) that were not directly involved in an incident, in order to have an acceptable readiness level in case more incidents should occur. Another interesting point was that even though the police were for the most part not localized together with the other emergency central, the cooperation still worked fine. And even when the police had their central in the same place as the fire/rescue and EMS service (like San Francisco) the work methods were still the same as in “divided” centrals (Sivertsen and Aakerman, 2010, p.3).

To sum up, they were very impressed with the way the emergency centrals they visited handled the emergency call service. It worked very well, and the emergency services were satisfied with the way the system worked. Also, it is interesting to note that they did not miss a closer connection between the emergency central handling the fire/rescue and emergency medical resources and the police. The crossing point between emergencies and criminal activity was clearly defined. If the incident was not a criminal activity handled by the police, then the fire department had command of the incident (Sivertsen and Aakerman, 2010, p.3)

In 2013, Sivertsen and Aakerman conducted another visit to a foreign country to observe their emergency centrals. This time, they went to the United Kingdom and Ireland. London, Liverpool and Dublin were visited.

In both the United Kingdom and Ireland, there are two main emergency numbers. 999 is one of the oldest emergency numbers in the world, and is the number most used and best known in the population. 112 is implemented alongside 999 in accordance with EU regulations, and works in the same way as 999. Interestingly, all calls to these numbers are answered by British Telecom, who then route the call to the appropriate emergency central. Fire brigades in both the UK and Ireland was pleased with this arrangement, as it eliminated misplaced calls, at a low cost in time spent sorting the calls by the British Telecom operators (Sivertsen and Aakerman, 2013, p.19).

In both the UK and Ireland there were processes taking place to reduce the overall number of centrals, even though it in the UK had come to a halt due to politics and the lack of funds to follow through on the intended reduction. In Ireland, the CAMP-project aims to take the three regional fire/rescue emergency centrals and establish one central for the entire country, with three different locations. By having the three centrals cross-connected and built technically identically, it would be giving Ireland a very high rate of resilience in the event of one of the centrals being unable to function (Sivertsen and Aakerman, 2013, p.15). This could be caused by anything from power-outages to fires that forces the central to be evacuated. In any case, the emergency central function would still be serviced by the other 2 centrals located elsewhere.

4.2 Emergency centrals in Sweden, Finland, Iceland and Denmark

In the interdepartmental work group report, they also gathered information on how the other Nordic countries handle their emergency call centrals. This is a summary on how Norway's neighbors organize and operate their emergency call services.

Sweden is a veteran of one emergency number, all the way since 1956. 112 has been the emergency number since 1996. In Sweden, the 112 calls go into SOS Alarm's emergency centrals. SOS Alarm is a company owned by the Swedish government and the counties/municipalities. They have a model where the police have their own separate operations central, while SOS Alarm handle the dispatching and coordination of emergency health and fire/rescue services (In some areas there are separate fire/rescue centrals as well) (Andersen *et al.*, 2009, p.67-68).

In Finland, they have 15 emergency centrals. These centrals receive calls, dispatches and coordinates all three emergency services. The centrals are run by the government and is regulated by its own law. Finland is special, not only because they have collocated all the emergency services, including the police. But what is even more unique, is the way they exercise command and control over the emergency resources. They follow a principle where any operation is lead by the commanding unit on location. This means that the emergency central does not engage in coordinating and running the operation itself, they just dispatch the appropriate resources (Andersen *et al.*, 2009, pp.73–75).

Denmark have had one emergency number for a long time as well, with 112 being the main number since 1992. Of the 8 emergency centrals in Denmark, 7 are run by the police, while the last one that covers the Copenhagen area is operated by the Copenhagen fire department. The 7 centrals that the police are in charge of, receive the calls and then redirects the caller to the appropriate operations central. (Fire/Health/Police). The Copenhagen central dispatch and coordinate fire/rescue and health resources, and redirects the call to the police operations central if necessary. It is interesting to note that all the police operated 112 centrals are cross-connected and can take over for each other, or redirect calls if they are not answered within a given time. This is not the case for the Copenhagen central (Andersen *et al.*, 2009, p.79).

Iceland have only one emergency central that handles the emergency number 112. They do however have a backup central that can be mobilized if needed. All calls come in to the 112 central. This central also dispatch and coordinate fire/rescue and emergency health care resources. Calls that need police attention are redirected to the police operations central that dispatch and coordinate police resources. The police operations central is located in the next room to the 112 central (Andersen *et al.*, 2009, p.86).

What is common for all the Nordic countries, is the use of one main emergency number. They are pleased with the system, there are not discussions of leaving one emergency number for several different ones (Andersen *et al.*, 2009, p.89).

4.3 SAMLOK project and piloting 112 in Drammen

SAMLOK is short in Norwegian for collocation and is the name of a project where all the emergency services were located together in Drammen in order to evaluate the effect of collocating the different emergency centrals. SAMLOK as a project did not look at merging the centrals or the emergency numbers (Bovim *et al.*, 2012, p.9). The location was the police station in Drammen, and the different centrals moved in one by one. First of them was the fire department in April 2009. The police followed in June the same year, and the medical emergency central was the last to join them in March 2010 (Bovim *et al.*, 2012, p.10–11). The final evaluation report was finished in December 2012, but SAMLOK made the foundation for what later would become the pilot project for trying out 112 as the main emergency number. More on that later, but first I will go through the main findings of the SAMLOK project.

The overall impression for the operators involved in SAMLOK, is that the service has improved for the better. Being collocated have given a better ability to handle incidents involving more than one of the emergency services. The understanding between the emergency services was better, and they also exchanged experiences better than had been the case beforehand (Bovim *et al.*, 2012, p.2).

The triple-alert was also reported by some of the emergency services to work better in SAMLOK. The report concluded that the increased contact and understanding

facilitated for a better use of triple-alert than earlier (Bovim *et al.*, 2012, p.23). With a better understanding of the big picture, and also a more detailed knowledge of what needs the other emergency services have, the operators are able to get the information they know is vital for the other services, and not just for themselves (Bovim *et al.*, 2012, p.26).

It even led to actual changes in how they worked. Both the police and fire department employed a staff member in charge of professional development, a practice that the medical emergency central had used for a long time. The police have an on-duty operation commander in charge at all times, while the fire/rescue and medical emergency centrals have a flat organization. During the course of SAMLOK, they too have adopted a similar organization to the police model (Bovim *et al.*, 2012, p.28).

Another important thing to note, is that there were not reported any issues regarding the handling of confidential patient information. Again the result instead was a better understanding between them how these different factors affected the emergency services. They got a better understanding of what the different services could and could not share, and it helped them to accept this. Worries that sensitive information would leak since they worked so close together also proved a non-issue. A separate disclosure agreement for all participants of SAMLOK was put in place at the start of the project (Bovim *et al.*, 2012, p.26).

Difficulties were encountered, and the fact that the three centrals have different geographical areas was one of them. This complicated cooperation, along with different radio communication systems being used in these different geographical areas (Bovim *et al.*, 2012, p.21). Another was the technical solutions that varied from central to central. A common platform would be easier to operate, coordinate and maintain. It is also important to note that several other factors may have affected SAMLOK, like the implementation of Nødnett, the new common radio communication system for all the emergency services (Bovim *et al.*, 2012, p.41).

Following in the footsteps of SAMLOK, the government decided to start a pilot project to try out 112 as the main emergency number. Drammen was chosen because it is the only place in the country where all the emergency centrals are located in the same place

(Justis- og beredskapsdepartementet, 2012, p.61). The project is still in progress today in Drammen, and the results are expected to be available by the end of 2014.

The latest development in this case is the rather subtle announcement that the firm Analyse & Strategi have been given the job to analyze different alternatives for the future organization of the emergency call service in terms of cost-efficiency. They were tasked by the Norwegian Directorate for Civil protection, which sort under the Ministry of Justice and Public Security (Analyse & Strategi, 2014).

4.4 Opponents of 112 as the only emergency number

It is not all smiles and clapping hands. There are many who are stern believers in today's separated system. They have voiced their concerns loud and clear, opposing the introduction of 112 as the only emergency number, handled by 112 centrals. One of the most often used arguments, is the risk of critical time being lost in a medical emergency. The fact that there might not be someone with a medical background answering the call, has caused worry in the medical environments (Kvanvik, 2009). With only one number to call, one fears that lives could be lost while waiting in line to reach an operator. This is because especially the police receive a high number of calls that aren't emergencies, prank calls, unintended calls, and so on. This could take up a lot of the capacity, causing difficulties for people trying to reach an operator.

Another feared consequence is that people in need will avoid calling 112, as it is associated with the police, and fear prosecution in certain cases (Feiring, 2003). The confidentiality between the patient and the health care services will not be taken proper care of with one common emergency number, and could result in loss of life because certain people might not request assistance (Strand, 2013). Several newspaper chronicles have also stressed the fact that 113 as part of the medical emergency system works very well, and there is no need to change a winning team that is one of the most important drive forces in the public health care system (Gilbert and Steen-Hansen, 2008), (Larsen and Braur, 2012). With over 90 percent of the calls coming in actually concerning health issues, and a total amount of ambulance missions that dwarf the amount that fire/rescue or police respond to, that claim is strengthened (Strand, 2013).

In response to the news of a cost-efficiency analysis regarding future organization of the emergency centrals, Professor Mads Gilbert once again took to the media to protest against the possible development of one emergency number. The same concerns mentioned above was mentioned, along with a list of 10 points for the appropriate authorities to consider. In his opinion, all the reports that have been produced over the years by the Ministry of Justice and Public Safety regarding one emergency number are too biased, and that the conclusions are given from the beginning. He calls for the development of connecting emergency centrals through teleconferencing tools, rather than changing the organization and emergency numbers. It is also pointed out that the proposed change in organization is not calculated in terms of what it will cost (Gilbert, 2014).

4.5 The effect of implementing one emergency number

In 2012 a study was released by the Norwegian Knowledge Centre for the Health Services after given the task by the Norwegian Directorate of Health to look at the effect of implementing one emergency number. They looked at other studies to gain a quick overview on the scientific knowledge base for this subject (Forsetlund *et al.*, 2012, p.2).

What they found was that there were almost no notable scientific work that looked at the effect of implementing one emergency number. The few studies that had been conducted had major flaws. So the most important finding that this group came up with, was that there is a desperate need for proper scientific documentation of going from several to one emergency number. They proposed that if Norway is to change their organization, a proper study should be conducted to document what effect it actually has before making a final decision (Forsetlund *et al.*, 2012, p.2).

Out of the four different studies that were looked into, two of them came from Finland, after they did their reform of the emergency centrals. This meant integrating the police into the already existing common central for fire/rescue and medical emergencies. The Finnish studies showed that after the reform, access time went up, so did response time (for the units), wrong use of ambulance and misjudgments of priority for patients (Forsetlund *et al.*, 2012, p.16).

The problem is that due to the flaws in the study, it is difficult to generalize the findings. A number of reasons could be behind the lowered performance, including operator training, getting used to new tools and major technical changes. Whenever a large reform is done, it will probably take some time for the new way of doing things to settle in, and maybe the measurements were done a little too soon after the reform (Forsetlund *et al.*, 2012, p.17).

An over 30 year old American study looked at how going from over a 100 medical emergency numbers to just one (911) affected people's ability to reach medical emergency centers. Not surprisingly, this massive change made it easier for the general public to know where to call (Forsetlund *et al.*, 2012, p.20).

Finally, they looked at a French study that found *association* between a common emergency central for fire/rescue and medical emergency services and lower mortality rate, and also found association between a common emergency call service and the mortality rate with heart attacks (Forsetlund *et al.*, 2012, p.20).

So what they found was that both positive and negative results could be found when trying to see the effect of fewer/one emergency number. And that a massive reduction of numbers makes it easier for the general public to know where to call. But due to the general lack of proper scientific research involving one emergency number, and the flaws of the studies looked at, like the absence of control groups and isolation of other external factors that may have affected the results, it is very hard to make heads or tails out of the available content. As mentioned initially, their most important finding was the striking absence of good evaluations of emergency call services.

4.6 Incidents

4.6.1 July 22, 2011

In the aftermath of the terrorist attacks, where 77 people lost their lives (Gjørsv *et al.*, 2012, p.13), every stone was to be turned in order to find out what went wrong that day.

There were many areas that needed improvement, but I will focus on how this incident exposed weaknesses in the organization of the emergency centrals.

One of the things that received the most criticism after the attacks, was the lack of ability to coordinate a quite large police force on the mainland and get them to Utøya island, where the terrorist executed 69 people before being arrested. The arrest was made 42 minutes after the first police unit arrived on site at the mainland (Gjørsv *et al.*, 2012, p.121). This was first and foremost the result of poor leadership and coordination of the operation. Utøya is located in Northern Buskerud police district. A small police district, with a relatively small police operations central. When the first calls started coming in, the central was manned by only one operator. This one person was also the on-duty commander of police operations. It was not possible, not even in theory, for one person to answer calls, dispatch units and coordinate and lead the operation. Due to the overwhelming lack of capacity to do all the tasks required, the operation was not logged as it should have been. This caused problems later, as the police officers coming in could not see what had been done earlier. A police investigator stepped in to help after a while, but this was not a trained operator, and could not utilize the systems used in the central. This made the relief a small one. 15 minutes after this, the vicarious chief of staff came and took over as commander of police operations. This allowed the original on-duty commander to assume the role of operator. By now, the operation had been severely hindered by the lack of capacity to do what was necessary in the police emergency central (Gjørsv *et al.*, 2012, p.122). The central was understaffed that day because the police district in question struggled to get the budget balanced. Members of the police force in Northern Buskerud had several times tried to warn of the consequences of running an understaffed emergency central, the last written warning as late as March 24 the same year (Gjørsv *et al.*, 2012, p.123).

The evaluation report also pointed out that the different police operations centrals varied in the performance when it came to securing vital information from the people calling the central. The operations central in Southern Buskerud police district, which is a collocated central along with the emergency medical and fire/rescue services, did this task satisfactory. The central in Northern Buskerud did not, however. The operator did not focus enough on getting hold of a boat, a critical transport-asset in this scenario. Also, information like phone number and date of birth was emphasized, while the caller

was in danger of being shot. In that aspect, that was not critical information. To make matters worse, callers were misinformed that police forces was on their way and just around the corner, but this was not the case (Gjørsv *et al.*, 2012, p.142).

In general, the large number of emergency calls to all the emergency centrals that day, was larger than the capacity available. This lead to a large number of calls going unanswered. There is not a system that routes calls that cannot be answered to other centrals. Since all the phone-lines were jammed down, the different emergency centrals also struggled to get in touch with each other. They did not have the same operational picture, and were unable to coordinate resources between themselves (Gjørsv *et al.*, 2012, Chapter 8), (Justis- og beredskapsdepartementet, 2013, p.96).

4.6.2 Årdal bus-murders

Another incident that exposed problems between the emergency centrals, was the Årdal bus-murders. On November 4, 2013, three people were brutally killed on a bus heading from Sogndal to Oslo. One of the passengers killed the two other passengers and the bus-driver. There were several things that did not go as it should that day. The responding police unit took a longer road than was necessary and they did not carry weapons with them. Because the police took so long to get there (the first responding units from the fire department and ambulance was at the location almost a full hour before the first police unit) the suspect had been taken down and held by the firemen and ambulance workers (Sogn og Fjordane Politidistrikt, 2013, p.2). But I will focus once again on the emergency centrals, and how they failed to perform as intended.

The first call about the incident came in to the medical emergency central at 17.21. They did not alert the other two emergency centrals like they should have. At this point it was classified as a traffic accident, as bypassers saw the bus by the roadside (Sogn og Fjordane Politidistrikt, 2013, p.9). It later became clear that the incident was more serious, but again the medical emergency central did not share their information with the police. The review afterward revealed that especially two calls to the medical emergency central in Florø, respectively at 17.23 and 17.40, should have resulted in immediate alerting of both police and fire/rescue centrals (triple alert). The caller in the

last call made it clear that there was an act of terror in progress, several casualties and an armed person with a knife. Even though the police were notified of the incident at this point, they did not get this critical piece of information right away as they should have (Sogn og Fjordane Politidistrikt, 2013, p.14).

The operations central for the police was also understaffed. According to instructions put in place after July 22, there should be minimum one operations commander and one operator on duty at all times. This requirement was in itself met, but a local adaptation caused problems for the operations central in Florø. They had a system where the operator would leave the central to help out with incoming arrests. The idea was to make good use of resources at the police station. On November 4, 2013, the operator was busy helping out with arrests, leaving the operations commander alone for 33 minutes. This included the very hectic first 17 minutes when the operations central was first notified of the incident. Having left without bringing a radio, the operations commander could not notify the operator. It is however important to note that the operator may not have been able to leave immediately depending on the situation. Also, the operations commander had his hands full anyway handling the incoming calls and coordinating the necessary resources (Sogn og Fjordane Politidistrikt, 2013, p.17).

The first police unit chose a route that was almost 40 kilometers longer because they thought the road might be closed for the shortest route. If the operations central had been properly staffed, the operator might have been able to assist them in the choice of routes. It is not certain the misunderstanding would be avoided, but it is possible (Sogn og Fjordane Politidistrikt, 2013, p.20).

4.7 Access time measurements

In the theory-chapter, there were presented some examples of requirements for how long the access time should be. Now I will present some empirical data on access time and see how it matches the theoretical requirements.

First up is data collected by Norstat in 2009 for the Norwegian emergency numbers as they are organized today. This data was produced for the report that looked at how the

emergency call service should be organized in the future. The results were on average 11,4 for 110, the fire and rescue services. 18,3 for 112, the police operations centrals which have the longest access time compared to the others. And finally 10,7 seconds for 113, the medical emergency centrals (Andersen *et al.*, 2009, p.92).

Sweden operate 112 as the main emergency number, and I have gone through some statistics to see what sort of access time they have. According to SOS Alarm's own publications, they average access time for 2010 was 6,65 seconds in 2010, and 8,39 seconds for 2011. In 2011, 87,3% of all calls were answered within 15 seconds (SOS Alarm, 2012, p.113). In 2012, the average access time was 7,7 seconds (SOS Alarm, 2013, p.55). And finally, the latest numbers for 2013 show an average access time of 11,5 seconds. This rise is partly caused by a large turnover and understaffed organization, according to SOS Alarm (SOS Alarm, 2014, p.12–13).

Finland have a requirement of all calls being answered within 12 seconds. Figures from 2008 show that this requirement is met in 87% of all calls coming in to the 112 centrals (Andersen *et al.*, 2009, p.73).

Iceland have very impressive record when it comes to access time. Their emergency central answer calls on average after 3,8 seconds. 95 % of all calls are answered within 8 seconds (Andersen *et al.*, 2009, p.86).

5. Discussion

So far, I have presented a substantial amount of data, both theoretical and empirical. In this chapter, the findings will be discussed.

5.1 Principles for the safety and readiness system

The starting point for this thesis was to look at advantages and disadvantages of having only one emergency number, with a special focus on Norway and whether it would be a better solution than today's system. I would like to start by looking at how this affects the four principles on which the Norwegian safety and readiness system is based upon. Since these are supposed to be guidelines for the total system regarding safety and

readiness, the emergency call services should be based on these principles.

And already with the first, one can argue that the possibility of one emergency number comes into conflict. The principle of responsibility states that whoever has the responsibility in an ordinary situation, also have it in a time of crisis. Today the three emergency services are fully in charge of their own organizations. From receiving the call, dispatching the responding units, and actually performing the mission, everything is taken care of within the same system. Introducing one emergency number and collocating two or three of the emergency services might produce issues regarding responsibilities in a crisis situation. On the other side, one emergency number/central would mean that the overall responsibility is in one place, rather than three. One can argue that this would reduce misunderstandings of who is in charge of what, thus increasing the effectiveness of the emergency services as a whole.

When it comes to the principle of equality, the same organization that handles everyday emergencies will also handle larger crises. The organization may bolster up to handle larger incidents, but it would retain the same shape more or less. So for this principle, there is no significant change. It might even improve, considering that a more robust and large emergency central would be able to handle larger incidents without having to drawing a lot of external resources. This would mean that the equality stays firm even with larger incidents.

The third principle of proximity one can argue is weakened. Since it is recommended not only to have one number and collocate two of the emergency services, but also reduce the overall number of centrals, it can be said that proximity is lost along the way. It would be true that the physical distance would increase, but this is to ensure that all of the centrals are robust enough to give the public the best possible service. It is also important to keep in mind that the operational level that the emergency central represents, does not go any further away from the units they are coordinating. A small step is added for the police, since the calls have to go through the 112 central before being transferred to the police operations central. The boots on the ground will still have the same level of proximity to their central when it comes to command and control. Since the overall number of centrals probably would be less, it would be located further away in some cases. But the added bonus of a central that does not have conflicting

geographical boundaries between the emergency services, could outweigh this.

The final principle of cooperation and interaction is a large factor in why this work is proceeding at all. It would enable better possibilities to cooperate and interact if all calls come through the same place, and two of the emergency services located together. It would be a lot easier to get the big picture of what's going on, and be able to make full use of all the resources that are available in all the emergency services.

5.2 Incidents and SAMLOK

Looking at the incidents like July 22 and the Årdal bus-murders, they point to several issues that became apparent during the course of events. The inability to share information between the centrals is striking. Whether it is due to technical inability because all the phone-lines are busy, or because the operator decides simply not to share the information they are sitting on, the result is a lack of coordination. This of course, at the expense of the people in need. One can argue that a better system for teleconferencing, dedicated phone-lines between the centrals and more focus on cooperation could improve the situation without the need for actually merging the emergency centrals and numbers. On the other hand, it could be said to be a cultural problem, or possibly hindered by strict rules for what kind of information can be shared. Regardless, they would stop the flow of information, no matter what tools are available to share this information.

Collocating emergency services in large centrals with a big geographical area of operations, would enable better command and control across the emergency services. With all the information coming through one portal (112), it would be easier to maintain oversight of what's going on. Being able to monitor not only what one of the emergency services are up to could prevent incidents like the one in Årdal, where the police took a longer route to get to the site because they thought the road was closed.

Not to mention the major difficulties that emergency centrals faced during July 22 and the Årdal-incident, where small emergency centrals had to handle massive incidents. They were understaffed and had no chance of doing a proper job. This severely hindered the ongoing operation, and caused the operators to make strange decisions, like focusing

on date of birth when the caller was in a life-threatening situation. It is likely that these misjudgments were partly caused by the immense pressure of the situation of which the operator was in no position to tackle. This speaks for larger and more robust centrals, as they would not find themselves in the same situation. That said, we don't know what the next major incident will be, and it could of course end up being too much for a larger central as well. Being low on staff due to budget cuts and the like could also happen. But it would still not be as bad as having one operator sitting alone, and having to cope with way more than any one individual is able to. It could also improve the effectiveness of the emergency services, and make better use of the total amount of resources available. This is backed up by the experience gained through the SAMLOK project, where all the emergency services felt that the collocation have led to a better emergency call service.

As presented in the theory-chapter, it is proposed to reduce the overall number of centrals. This should lead to more robust and generally better trained operators because the overall number of incidents handled would be larger. One can argue that a reduction in the total number of centrals take away crucial local knowledge about the actual conditions on the ground, the geographical and environmental challenges, and so on. Again there are empirical data that suggest there are several challenges for smaller emergency centrals. They are more vulnerable in terms of staff, and have been exposed as critically understaffed on both July 22 and at the Årdal bus-murders. The capacity is nowhere near as good as the larger centrals. Unfortunately, we see that major incidents also occur outside of the mass centers of population. The fragmented centrals and different geographical boundaries also contribute to the weaknesses of many and small emergency centrals. Larger centrals that do not have geographical boundaries issues (as one emergency number would eliminate this problem), the ability to handle large and complex incidents would be better. It also makes sure that there is a robust and competent unit in place to handle incidents, regardless of where in the country it occurs. The service would and should be just as good whether the emergency takes place in one of the large cities or far out in the more scarcely populated areas. Powerful map and fleet-control software, along with the local knowledge of the units in the field can counteract the increased distance to the emergency central.

The SAMLOK project has shown great promise. The report regarding the continued

project that also involved the same emergency number (112) for the central in Drammen is not clear just yet, but the evaluation of the SAMLOK project was very encouraging. When looking at the incidents in Årdal and July 22, many of the shortcomings could have been improved if the recommended theoretical solution for the emergency call service had been in place. But what is also interesting, is that they also match with how the Drammen central is organized. The theory behind advantages gained with one emergency number and collocation of emergency services, match up with the experiences of the SAMLOK project. Better cooperation and understanding of the needs between the different emergency services are some of the improvements. They've learned from each other, and the ability to alert all the services have increased. The fear that information would “leak” internally have not turned into a problem. All these things are good reasons as to why the SAMLOK project further strengthen the side of why one emergency number and collocation should be the future. But on the other hand, it is hard to single out among many factors what have had the greatest impact on the cooperation and coordination. The Nødnett project with one common radio system for all the emergency services is one such thing.

5.3 Arguments against one emergency number

There are several arguments against one emergency number. It would of course be an unacceptable situation if the public would be reluctant to call for help because they fear prosecution. This is especially relevant for certain weak groups in society like drug addicts and illegal immigrants. In extension of this problem is also the confidentiality of patient information that today does not leave medical hands. If the call takers at the emergency central are no longer recruited exclusively based on medical background, crucial misjudgments could occur. A patient with an urgent heart attack could lose precious seconds that's absolutely vital in order to save his/her life, because the emergency central operator does not have the knowledge to properly assess the situation.

In the recommended model for organizing one emergency number, the police are not part of the 112 central that receive the emergency calls. Therefore the fear of people not calling for medical help because they think this would result in problems with the police, is not a valid argument. Also, this means that the operators would have a

background from either the health services or fire/rescue. The proposed time lost in a medical emergency because an operator with the “wrong” background answered the call, would be at a minimum. It is also possible to educate the operators to better handle all calls coming in, including medical emergencies. The confidentiality regarding patient information when they contact the emergency medical service today is another thing that has been said to not be taken care of properly if there is one number where not all the operators are medical personnel. Patient information is confidential by law, and must not get into the wrong hands. The law could be changed however, to fit a new organization. And even with today's laws, they have made it work in the SAMLOK project. Having collocated the emergency services actually resulted in more understanding of why some information could not be shared, and they did not have issues with confidential information leaking to the other services. This shows that it is very much possible to maintain the rights of the patients, and still have one emergency number.

A few of the studies that have been conducted concerning one or fewer emergency numbers and collocation show that results are poorer than they were before. Finnish studies show increased access time, response time and misuse of ambulances (Ambulances sent when there was no need for this resource). The rate of misjudging patients also rose. These Finnish studies are important, because they are often referred to as scientific “proof” that merging emergency numbers are a bad idea. This could mean that changing to only one number and collocating emergency services in Norway would not be the best solution, as we could see the same results here. On the other hand, the studies in question have been criticized for having several flaws. The absence of control groups and isolation of other external factors contribute to making the results from these studies hard to generalize. Therefore it cannot be justified scientifically that one emergency number results in a worse emergency call service, based on the available material.

5.4 Access time

Access time is a key to a well-functioning emergency call service. In the theory-chapter, a goal of 90 % of the calls answered within 10 seconds, was presented. This is a good starting point for what access time is acceptable. The Swedish government has an 8

second limit for access time in their 112 centrals. Access time is also one of the things that opponents of one emergency number focus on. They argue that if all the numbers are merged into one, the access time will rise to an unacceptable high level.

The empirical data show that 112 in Norway has a longer access time than the other numbers, which would result in a combined longer access time if merged. An increase in access time to a level that could mean critical calls being put on hold, would be a show-stopper for merging the emergency numbers. However, it is important to note that if the reform is going to happen, one would have to do something about the capacity at the 112 centrals. With a much higher amount of calls all going through the same number, the capacity must be increased accordingly. Looking at empirical data from other countries, we can see that it is absolutely possible to create a system that can meet the requirements for access time, even when all the calls come through the same number. It is of course a prerequisite that the system in itself is created robust enough to handle the calls within the given time, but there can be no doubt that it is possible to do so. Iceland has an excellent access time compared to the other numbers I have looked at in this thesis, even when compared to the separated numbers in Norway. One must not forget of course that Iceland is a rather small country, but it is still very impressive.

5.5 Other countries

Other countries do things differently as we have seen in this thesis. But all these countries, from the United States to Great Britain to tiny Iceland all have one emergency number. The organization is vastly different from dedicated emergency central organizations to being operated by police, fire department and so on. This has a number of reasons, but they all share the one emergency number as a common trait, and they are pleased with this as a platform upon which they base their emergency services.

The lack of good scientific data that studies emergency centrals and emergency numbers is of course a shame, but the fact that one emergency number exist in so many countries also sends a message. One common emergency number have a very long track record in some of these countries. I have looked at a few, and they are pleased with the way it works for them. One could argue that it is a matter of not knowing better, but many of these countries handle larger incidents both in terms of size and number. If there were

major issues, these would be exposed like they have been in Norway. So the question is when all these nations already have this system and do not think about changing it, why shouldn't Norway be able to do the same?

6. Conclusion

When reviewing this bachelor thesis, a lot of material concerning one emergency number have been processed. Advantages and disadvantages have been presented and discussed.

I started out this thesis with the question of what advantages and disadvantages are associated with one emergency number. I did not set any limits for how it should be organized, what to do with the current laws regulating the different services, and so on. What this thesis has shown, is that it's not just about this one phone number 112. An emergency central is part of a complex system, and its efficiency is decided by several other factors, from how the service is organized to what technical solutions are available to dispatch and coordinate the boots on the ground. All of these factors must be considered and taken into account when deciding the future of the emergency call service. All in all, there is no perfect solution. But we have to make an effort to get the best system possible.

In my opinion, there are not any really good reasons why one emergency number should not be the future for the Norwegian emergency call service. One number is easier to remember, especially in a critical situation. It gives the public a more streamlined and simpler service, and also enables new possibilities for the emergency services to do their job better with closer cooperation and coordination than before. Several incidents have exposed the flaws of today's system, and these alone are significant enough to result in changes as to how things are done. Or to put it in other words: The system failed when we needed it most and lives were unacceptably lost.

Locating the emergency services together behind one number would enable them to better handle large incidents and coordinate between themselves. If done right, a new system can be even better than today. We have seen several examples of how the emergency centrals fail to coordinate their efforts during critical incidents. More focus

on coordination instead of collocation is brought up in defense of today's system. But all the bells and whistles in the world does not make a difference when the operator at one of the emergency centrals decides not to share information. This makes merging the emergency centrals a good idea, as it shortens the distance between them both physically and technically.

Even though the police are to retain their operations centrals in the current proposal, they too should be part of the collocation. Several of the advantages one hopes to achieve from a new system depend on shorter distances between the emergency services, both physical and technical. That said, the need for the police to be able to conduct their own operations outside a common central is there, and should be taken into consideration. This can be solved by having the centrals in rooms next to or close to each other, in the same building. The United States have more or less the same solution as is proposed for the Norwegian system, with the police separated from the other emergency services in the emergency central, and sometimes not even collocated at all. This shows that this is a possible solution, even at a much larger scale than what is the case in Norway.

With fewer centrals and collocation, one must not forget the possible risk that follows fewer units. If a central is knocked out for some reason, that area would be without a functioning emergency call service. That is why, whatever form the future centrals take, they must be cross-connected and technically the same, so other centrals could take over without much effort. Ireland show a good example of how this could be done with their CAMP-project. Since the goal of one emergency number is a more robust and better service, redundancy is a natural part to take into consideration.

There is no doubt that the access time can be acceptable with one number, given that necessary steps are taken to ensure proper capacity. Studying the other countries with one emergency number, they have access times that are well within the requirements that are set in Norway. Combined with a system of cross-connected emergency centrals, access time can be further improved at larger incidents with vacant centrals being able to receive calls that the main central handling the event is not able to process.

The arguments as to why one emergency number should not be chosen as the future

system do not really hold up when they are discussed. Access time is already mentioned, the rest is covered in the discussion-chapter. The resistance from the medical community in particular, seems more like a professional battle and fear of losing control over the emergency central. It appears somewhat like grasping at straws when scientific results are repeatedly held forward as documentation of why one emergency number should not be chosen. At the same time, the very same scientific results have been criticized and said not to be able to generalize by the Norwegian Knowledge Centre for the Health Services.

The SAMLOK project shows that the result of collocating the emergency services is a better emergency call service. It gives the advantages one hoped for when the project was started, and has also shown that several of the concerns regarding the negative effects of collocation turned out not to be a problem at all. It is still hindered by different technical solutions and geographical boundaries. But with those removed, there is no reason why the results should be even better than they are today. The fact that Nødnett and other factors may have also had an effect on the results is to me not that significant. The aim of Nødnett was also to get better cooperation and coordination, in addition to added radio security. Two different measures that promote cooperation should give a better result than just one, and the ratio between them is in itself not that important as long as there is an improvement on both fronts.

The bottom line is a recommendation to go for one emergency number with fewer and more robust centrals. Technically identical and cross-connected, with all the emergency services collocated as much as possible. It is in my opinion no doubt that this would lead to a better emergency call service that is less likely to fail us when the need is at its most dire. And that is precisely why we have an emergency call service at all.

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