Evaluation of Enhanced Collaboration Between Fire and Rescue Services and Security Officers

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ABSTRACT

The hypothesis of this study is that collaboration between fire and rescue services and new actors, with basic rescue skills, might be a cost effective way to improve emergency response. Interview studies of collaborations between fire and rescue services and security officers in three Swedish municipalities are presented. Seven semi-structured interviews are conducted with representatives from the security officer companies, the fire and rescue services and security managers at the municipalities. The method used to evaluate the collaborations quantitatively is Cost-benefit analysis. The collaborations have positive economic effects for society that most likely outweighs the costs. There also exist several external effects that are not possible to value monetarily, but that represent positive values for society. The results and their generalizability are discussed, as well as the possibility for these new collaborations to improve crisis management.

Keywords

Cost-benefit analysis, fire and rescue service, security officers, new actors, emergency response

INTRODUCTION

The municipalities in Sweden are required by law to organize fire and rescue services (FRS) so that rescue operations can begin within an acceptable time and are handled in an efficient manner. Efficiency enhancing activities in the Swedish FRS are generally related to reductions in response time. The importance of the time factor has been studied in several cases and it correlates strongly with the outcome of the incident (e.g., Mattsson & Juås, 1997, Jaldell, 2004, Sund et al., 2010). Previous research on time savings in the FRS has mainly been focusing on optimizing the location of the fire stations or optimizing the number of resources in terms of firemen or fire vehicles sent to an emergency (e.g., Hogg, 1968, Batta & Mannur, 1990).

However, another way to increase the efficiency in emergency response is to look at existing additional resources that may be utilized. Within a municipality, there exist a number of actors and organizations with skills that might be suitable in rescue operations. There are several resources with basic training in CPR (cardiopulmonary resuscitation) or fire suppression for instance, which are not utilized to any large extent in rescue operations today. The existing numbers of non-traditional actors in Sweden that contribute in routine emergencies are few. Little research has been dedicated to investigating the possibilities and the potential of new actors in rescue and response (Stenberg et al., 2010).

Some collaboration between emergency services and new actors do exist in Sweden. One example is the SALSA project, where taxi drivers and FRS are equipped with defibrillators in order to help the emergency medical services respond to cardiac arrests. A cost-benefit analysis showed that this is a very beneficial collaboration for society that saves several lives (Sund et al., 2010). Other possible new actors are home care personnel equipped with fire extinguishers, outdoor climbing club members assisting in climbing accidents, and security officers (employees of private security companies) helping the FRS to respond to alarms. However, few collaborations of this kind have been identified and studies evaluating them are needed in order to analyze whether they are cost-effective for society. This paper focuses on security officers.

The purpose of this study is to make an economic evaluation of collaborations between fire and rescue services and security officers. The hypothesis is that new actors in emergency response might be a cost-effective way to shorten the response times and make the rescue operations more effective in order to save lives, reduce injuries and property loss. An additional aim with the study is to investigate the requirements for the collaboration, both

methodological – how the normal operations for both FRS and security officers need to be adjusted – and technical, e.g. which communication and information systems and other equipment are required.

STUDY SETTING

This work was performed by studying collaborations between FRS and security officers in three Swedish municipalities: Söderköping, Södertälje and Botkyrka. Söderköping is a small municipality with roughly 15 000 inhabitants, and manage their own FRS. They have three fire stations, manned by mostly part time fire fighters with a call-out time (the time from when the alarm reaches the fire station, until the fire engines leaves the station) of five minutes. Södertälje and Botkyrka, municipalities in the Stockholm region with approximately 85 000 inhabitants respectively, rely on Södertörn FRS, a coalition that provides service for nine municipalities in total.

In all the three municipalities, security officers have historically been used for guarding and patrolling municipality buildings and infrastructure. In Söderköping, the security officers had by their own initiative also started performing preventive work by building relationships with the citizens; talking to children, reporting things they saw to the police or the fire and rescue service. Around the same time, Södertälje and Botkyrka commissioned their own security officers to additional similar tasks, due to an increasing cost for vandalism in the cities. This was the starting point for an enhanced collaboration between security officers and FRS in the three municipalities, where security officers started to respond to fires and other accidents.

METHODOLOGY

Seven semi-structured interviews were conducted that focused on conditions, resources, difficulties and potential for the collaborations. Three interviews were held with security officers that work at an operational level, one from each of the municipalities. Two interviews were held with security managers at the municipalities in Botkyrka and Södertälje and two interviews were held with the FRS, the fire chief in Söderköping and the project manager at the FRS in Södertörn.

The method used to quantitatively evaluate the collaborations was cost-benefit analysis (CBA, see for example Boardman et al., 2011). In short, the method is used to assign monetary values to the benefits and costs that affect the society. It is used to assist social decision making and maximize the well-being of society by allocating resources in an efficient manner.

One of the main benefits from the collaboration is decreased response times, and one of the challenges in this study was to value the time reductions in monetary terms. Previous studies on the importance of the response time have been made using regression analysis. These studies examined how the outcome from the accident, in monetary terms, was affected by the response time (Juås & Mattson, 1997, Jaldell, 2004). The time values from these studies were used when evaluating the time savings in this study.

Quantitative data was collected from incident reports from the FRS and from the security officers. The reports from the FRS are documented by the foreman, in a standardized format, and contains information about when the FRS receive the alarm and when they reach the accident site as well as information about the accident. The incident reports from the security officers are filled in after they have responded to an incident; they document response times as well as their contribution to the response. These reports were compared with each other in order to examine how much the response times were reduced by having security officers respond to alarms. The reports were also used to analyze to what extent the security officers contribute to the fire and rescue response. However, due to lack of data, it was only possible to do a quantitative analysis of the response time reductions in the municipality of Söderköping. 60 incident reports were identified from the period the collaboration has been proceeding (2.5 years). The costs were determined through interviews with the fire chief in Söderköping.

RESULTS

In the three studied municipalities, perhaps in particular Söderköping, the FRS main motivation for the collaboration was to reduce the response times. The fire chief in Söderköping pointed out that *the citizens want to get help fast, they do not care where the help comes from.* So today, the security officers receive the alarm at the same time as the FRS and since they are commonly on patrol in the city, they are able to reach the incident scene fast, in many cases before the FRS according to the security officers. The FRS provides the security officers with extinguishing materials and education in fire suppression.

These collaborations have changed the character of the security officer profession in the municipalities. Now

their work is integrated with the work being done by the emergency services and their tasks extend beyond building coverage. Their work consists of social and preventive work; they visit schools to talk to children and act as grown up role models. The costs for vandalism have also been reduced since the collaboration started according to the security managers in Botkyrka and Södertälje.

The security officers' role at an accident differs depending on the nature of the event. If a fire has not spread significantly, the security officers explained that they try to suppress it with hand held extinguishers or extinguishing grenades. Sometimes the fire has spread so that the material and knowledge they possess is not enough to mitigate the fire, but even in these cases they play an important role by supporting the traditional emergency services according to the representatives from the FRS. For instance, if they arrive to the incident scene before the FRS, they can provide information and give the fire fighters a better understanding of the situation. The security officers pointed out that they try to contribute by informing about the color of the fire, where the fire has started and its current status. They can also help by explaining the best and fastest way to reach the accident scene, and since they have keys to many of the buildings, they can help by opening gates and doors. Furthermore, they can support possible victims, assist with traffic, and perform other tasks that make the response phase more efficient and allow the FRS to end the operational work earlier. Subsequently, the FRS expressed that the collaboration permits them to return sooner to the fire station, respond to new calls, or perform preventive work, thus maintaining a good level of preparedness and a high utilization of the fire and rescue resources.

The security officers have basic knowledge in fire suppression and receive one day of additional training from the FRS. However, all the interviewed security officers believe that more education and training would improve their contribution in multiple event types. For instance, they expressed that they know better what to do when handling a fire, then when arriving at a traffic accident. With the right instructions, they feel that they should be able to contribute more at those accidents as well.

The security officers also stated the need for better communication channels, such as portable radios with good coverage that allows them to have continuous contact with the FRS through direct links. The FRS has provided them with beepers or radio sets that are installed in their cars, but since they spend plenty of time on foot, they are not able to hear all the alarms. Better means of communication with the emergency services would simplify and make their work more efficient according to the interviewed.

Identified costs and benefits

Through the interviews it was possible to identify benefits and costs from the collaboration (see Table 1).

BENEFITS	COSTS
Reduced response times	Extinguishing material and refill
Situational awareness	Radio sets/beepers
Keys and good local knowledge	Medical kits
Preventive work	Training and education
Additional tasks during the response work	Turn-out cost for security officers

Table 1. Benefits and costs identified in the interviews

The most important benefit from the collaboration is that the security officers can quickly reach the incident site, thereby breaking or mitigating the development at an early stage. The security officers also have good local knowledge and keys to many objects and can be helpful by providing information or assisting the FRS. It has also emerged that the preventive work that the security officers perform by talking with young people and other groups in society have a positive effect which is important in a long-term perspective.

However, the only benefits that can be estimated in monetary terms are the reductions in response time and the work that the security officers can do before the FRS arrive to the incident scene. The costs for the collaboration consist mainly of the extra material that is required; medical kits, extinguishing materials such as fire extinguishers and fire blankets, as well as communication equipment. Opportunity costs[1] also arise when the fire and rescue service educate the security officers, and when security guards respond to emergencies.

[1] Opportunity costs measure the value of what society must forgo to implement the collaboration, e.g. work that might have been done by the security officers when not responding to FRS alarms.

Cost-benefit analysis

The quantitative analysis is performed for the municipality Söderköping only, due to lack of data on response time reductions in the other municipalities. It is assumed that the difference in response time between security officers and the FRS (Δt), when the security officers reach the accident first, can be assigned a monetary value. However, the security officers are not assumed to be capable of handling all types of emergencies by themselves. The proportion of the total effort conducted by security officers is called p. This depends on the emergency type and at which the stage the security officers arrive. If they arrive at an early stage when e.g. a fire is not fully developed, it is likely that the security officers can manage to put out the fire, i.e. $p = 1$. But if they arrive when the fire has spread, the security officers will not have the same possibility to mitigate the fire. Therefor it is important to evaluate the proportion of the effort that has been handled by the security officer. The time value of the object is v. The total benefits from the interventions are called B:

$$B = \sum_{i=1}^{n} B_i = \sum_{i=1}^{n} (\Delta t_i \times p_i \times v_i)$$

From (n =) 60 incident reports, seven cases are identified where the value of response time reductions can be calculated. In these seven cases, the security officers arrived before the FRS and were able to mitigate or extinguish the fire (see the selection process in Table 2). In several cases the security officers were not able to contribute because of the incidents type. For instance many of the incidents are false alarms, where the security officers might have reached the accident before the FRS, and concluded that no further response was necessary, thus making a positive contribution. However, since the time value for false alarms is zero, this incident will not affect the total benefit. In some cases they also reached an incident where their competence was not enough to mitigate the fire.

Incident reports from the security officers	Nr. of identified reports	Security officers reach the accident scene before the FRS	Reports with substantial contribution from security officers
Fire in building	5	3	0
Fire not in building	12	11	7
Automatic alarm (false alarms)	23	16	0
Traffic accident	10	4	0
Other	10	6	0
Total nr. of reports	60	40	7

Table 2. Selection process of incidents that could be used in the CBA

The fire chief estimates that the proportion of the total effort handled by the security officers in the seven identified cases was 100 percent. In five of these cases, they suppressed small fires with no risk for diffusion or large social cost. However, two of the suppressed fires implied substantial risks for spreading and damage. By calculating the saved time in the two latter cases, the proportion of the effort being handled by the security officers and the value of that time[2], it is possible to conclude that the saved value from these efforts amount approximately to 173 000 SEK (~ €20 000) annually.[3]

Costs exist for material (totally 9 600 SEK) and education (totally 17 200 SEK). The cost for education is represented by the opportunity costs for the FRS and the security officers expressed as their wage costs during the time spent on education. The turn-out costs for the security officers is calculated by using the average time spent at the incident scene multiplied with their wage costs for that time (totally 6 750 SEK). The refill of fire extinguishers is estimated to a total of 6 300 SEK.

Annual costs are calculated using annuities[4] and the current timespan of the collaboration, which is 2.5 years. The costs for turn-outs and refill of fire extinguishers (operating costs) are already expressed as annual costs. The total annual cost during this time has been calculated to approximately 21 400 SEK (~ €2 500).[5] The annual

[2] We use the time values from a previous study made by Jaldell (2004) expressed in 2011 prices.

[3] (1)11 minutes × 1× 30820 SEK = 339020 SEK (2) 3 minutes × 1× 30820 SEK = 92460 SEK. The total amount is then divided with 2.5 which is the time the collaboration has been ongoing.

[4] The annuity factor used is 2.345. The recommended Swedish social discount rate is 3.5 percent.

[5] The prices are expressed in 2011 years prices using Swedish consumer price index. Market prices (including taxes and subsidies) with an additional cost for 30 percent are used to reflect the tax on the productive alternative use of private consumption and the cost for public funds (ASEK, 2012).

social net benefit is approximately 151600 SEK (~ €17 500). The cost-benefit analysis suggests that the benefits from time savings amount to 8 times the invested amount.

DISCUSSION

We have shown the collaborations between FRS and security officers most likely have positive economic effects for society. In the CBA in Söderköping, the return on investment is high. The interview study also shows that there are several external effects that are not possible to value monetarily, but that represent positive values for society: improved situational awareness for the FRS, an extra pair of hands that makes the operational work more time efficient, preventive work et cetera. Our quantitative analysis therefore underestimates the value of the benefits from the collaboration. More training, better guidelines at different types of accidents and better communication channels might also make the collaborations more effective.

The results from the quantitative analysis are somewhat weak since the number of incidents that can be used for calculating benefits is limited to two cases. Without these incidents the value of the efforts made by security officers would not have been considered to add any benefits for society. However, as previously mentioned, several non-quantifiable benefits exist. Thus, this study highlights some of the difficulties of evaluating rescue operations quantitatively. The lack of data and evaluation methods are limiting the quantitative analysis considerably. However, we can conclude that the costs are low and therefor it is likely that the collaboration between security officers and FRS is socially profitable. Also the result implies that just two successful incidents might be enough for the collaboration to be cost-effective.

Better reporting systems for the security officers would allow improved results of the economic evaluation and make the results more generalizable. More incident reports would also have allowed us to calculate the standard deviation and to do a sensitivity analysis using for instance Monte-Carlo simulations. Thus, there is a need for improved information systems, which can be used for communication as well as reporting, feedback and analysis. One other line of interesting research is to study the potential of scheduling patrol routes for security officers, taking into account their increased responsibilities as first responders for the fire and rescue services. This raises the issue of how to balance the scheduling between the security officers primary task (security and building coverage) and their secondary task (being available for fire-fighting and rescue).

Enhanced collaboration between new and traditional emergency response actors can also contribute in case of a crisis. An existing collaboration for routine emergencies includes methods, learning to work together and trust each other, as well as clear command and control structures. The number of resources and their capabilities that can be used in case of a crisis is therefore effectively increased. Equipment and systems that are used for routine emergencies should be easily adaptable for the larger emergency as well. Thus, existing crisis management plans and preparations should be altered to take full benefit from collaborations, as the ones studied here. It is hard to imagine something more valuable than the experience from working together on a daily basis, when you are about to tackle something out of the ordinary.

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