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Abstract: Federal first responder funding is estimated to be $98 billion below the minimum required level over the five years ending in 2010. A significant portion of that shortfall can be covered by savings attained by eliminating non-public-good services, initiating public-private partnerships for meeting peak time demand in emergency situations, and contracting-out other public services. We concentrate on such savings in the context of response to false calls to police, fire, and ambulance services. Solving the false alarm problem for police, fire, and ambulance services and eliminating some non- public-good police services could release significant service-hours and 23.7 to 31.4 percent of the required additional Homeland Security (HLS) annual spending. Reducing false alarms means 88,000 police, fire, and ambulance first responders could be shifted to HLS activities.

Response to Reviewers:

The Economics of Emergency Response

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The Economics of Emergency Response

A study under the auspices of the Council of Foreign Relations (Rudman, 2003) estimates a $98 billion shortfall in federal first responder funding over five years ending in 2010. As of 2004, 76 percent of cities reported that they had not yet received first responder or critical infrastructure funding (USCM, 2004: 7). Local governments do not have the resources to provide for the additional necessary first response services. Increased spending on the foreign wars on terrorism ($10 billion a month) has further reduced funds available for local law enforcement agencies. The combined federal allocation to the Community oriented Policing Services and State and Local Law Enforcement Assistance grants decreased from $4.4 billion in 2001 to $2.5 billion in 2006 (Towns, 2007).

Police, fire, and ambulance services are already strained in their ability to provide basic services. A major reason is that many of the calls to which emergency services respond are of a non-emergency nature; only five percent of calls to 911 are for a life threatening emergency (Dann, 2005).[1] Police response to burglar alarms comprises ten to twenty percent of all calls for service, but 94 to 99 percent of those responses are to false alarms (Blackstone et al., 2005; Sampson, 2001). More than half of fire alarm responses in 2003 were to non-valid alarms (NFPA, 2005). Only one quarter of ambulance calls coming through the 911 system in 2003 involved a true emergency (Dann, 2005). One is left with the inevitable conclusion that considerable resources are expended in the response to false calls for emergency service.

In addition, community based first responders perform many functions that are non-public in nature. For example, police escort funeral processions, unlock cars, and investigate minor traffic accidents.[2] If first responders perform non-public and non-valid emergency services, the resources might be shifted to more productive uses.

This paper applies economic principles to the provision of emergency services and draws implications for emergency response and homeland security (HLS). It examines the extent to which competition and private sector resources can be used to improve the efficiency of service delivery. It will examine whether governments could shed or shift emergency services to competitive markets, including the private sector, while improving the quality and quantity of service. Models of public-private partnerships will be introduced to improve service delivery and efficiency.

Section 2 uses economic principles to determine which emergency services entail public goods attributes and are appropriately under the domain of government. Section 3 reviews the specific features of police service. In section 4 we evaluate the experiences of the fire services and in section 5 we examine ambulance service. Section 6 analyzes the political barriers to achieving an efficient solution. Section 7 discusses the results, recognizes some possible qualifications, and draws implications for homeland security. Section 8 concludes the paper.

The Theory of Public Goods

Public goods, externalities, and market power reduce the efficiency of markets and raise the possibility of beneficial government action. Market failure, however, does not guarantee government success nor is the appropriate government response necessarily public supply. Alternatives to public supply which maintain competition, such as contracting out, grants or subsidies to private suppliers, vouchers or public private partnerships, may be more beneficial.

Samuelson (1954) defined a pure public good as non-rival and non-excludable in consumption. When first responders attend to an emergency situation they are unable to perform other duties. Thus, emergency response is not a pure public-good as defined by Samuelson, but does

fit the notion of a commons good (Buchanan, 1965). As the population of the community rises, congestion occurs, causing a positive marginal cost for each additional individual using the public-good; or, equivalently, service per consumer decreases. Goods that have this characteristic are termed common pool goods. A characteristic of emergency response is the fact that like a common pool good, no property rights exist so that the resource tends to be overused, causing congestion (Cornes and Sandler, 1986:4). Response to a bona fide call for police and fire is identified as a local public-good with congestion. Government provision of emergency services at prices below marginal cost causes extensive use of these services or congestion. Congestion, in effect, suggests that the resources committed to emergency response have an opportunity cost. Non-rivalry no longer applies to the good, and its provision may require public intervention.

The second characteristic of our local public good is that no ex ante knowledge of the supplied service exists, namely, whether it is a public service or a simple private service. Only ex post, after the service is provided, can it be determined if it was a public or private good. The fact that, for example, fire and burglar alarm calls are usually prompted by electronic devices at the site leads to the difficulty of distinguishing a priori between false and real events. Verification by telephone reduces the number of false calls but the rate of response to false activations is still overwhelming.[3] The public police, fire and ambulance emergency teams know only after the response whether there was a valid emergency, and thus are providing a public-good. In any event, public provision of emergency service is in part justified by its life-saving character.[4]

Government intervention is done through regulation. Local governments regulate response to alarms through ordinances that price emergency response to such activations. Many communities charge for more than 3-5 false activations per year. The level of the regulated prices affects the extent of care exercised by alarm owners. Free or under pricing for false responses yields over production of false alarms while pricing above cost yields both under installation and use of systems

compared to what is socially desired. Chicago school economists have long claimed that regulation, as discussed here, changes behavior sub-optimally.[5]

Police Services

In 2000, there were 708,022 full time sworn personnel in state and local police departments, of whom 425,000 were regularly assigned to respond to calls for service (Bureau of Justice Statistics, 2002). Private security employment ranges from one million to 1.5 million (Bureau of Labor Statistics, 2004-2005; Pastor, 2003: 42). Since September 11, 2001 police have been experiencing added demands for their services. The heightened security alerts of the U.S. Homeland Security Department impose essential burdens.[6] On a daily basis police are required to search for possible terrorist activities and identify and apprehend terrorists. Securing major events with large congregations of people and the multitude of potential targets are new and demanding tasks. In addition, police spearhead first response teams in case of an incident. The threat of terrorism requires the police to plan, prepare for, and conduct desk top exercises for various possible scenarios.

The issue is whether police could increase their public security activities, including homeland security, within their existing budgetary constraints. The first category of possible police reform includes eliminating the services that have no public goods attributes. Since these services provide private benefits, existing demand may be sufficient for private companies to enter and provide these non-public services. In addition, elimination of some police services could cause private companies to change their operation in order to minimize crime related losses. A second category for savings of police resources includes other public-good-type services that remain under

police responsibility but could be contracted out to public or private entities. Such contracting out will shift the production of service from bureaucratic-monopolistic government to more competitive markets, thus introducing competition among providers and possibly increasing efficiency in the delivery of the service.

Police, in general, perform many services that do not have public goods attributes including investigating minor traffic accidents, escorting funerals and oversized vehicles, animal control, unlocking vehicles, recording citizen complaints, and responding to false alarms (Blackstone and Hakim, 1996: 7-9). Often citizens turn to police for lack of an obvious better alternative. Pastor (2003) reports that 80 percent of what police do is non-security and non-public good in nature. More than 60 percent of Toronto's police calls are responded to by alternative response units, suggesting that sworn police officers do not have to deal with these calls. Eighty percent of patrol responses are for non-criminal service requests (Cunningham et. al., 1990: 110).

Response to burglar alarms is one specific police function that has the potential to be privately delivered more efficiently. As stated earlier, 94 to 99 percent of responses are to false calls, and the comparable percentage for fire calls, to which the police may also respond, is fifty percent.[7] Such calls are the only ones that are not initially screened by police dispatchers. These responses entail no positive externalities, which exist when a burglar may be caught, reducing the chance that others will be victimized, and therefore do not justify government intervention. Nevertheless, police departments in most North American communities continue to provide response to all burglar alarm activations. Since they cannot know that any given call is false, they are expecting to prevent what otherwise might be economic or physical harm, a better safe than sorry argument.

Government reacts to the increasing problem of false burglar alarms by imposing fines, engaging alleged violators in the judicial system, and possibly even incarcerating some. Over time,

repeat activators of burglar alarms face increasing levels of fines; in some communities fines escalate with each additional false police response, and some activators are even charged with misdemeanors. As a specific example Montgomery County, Maryland fines $25 for the second alarm response, escalating to $4,000 for the 20th false response in a year to a commercial establishment (Blackstone et al., 2001). The escalation in fines for residential properties is lower, reaching $1,000 for the 20th false call.

Police response to a false alarm is a strictly private service, and it would not appear to be the responsibility of the public to finance it. Clearly, in the rare instance of an actual burglary, police response is a public good. On a practical level, the high rate of false activations has led most police departments to lower their priority of response, significantly reducing both the deterrence effect of alarms and the apprehension rate when an actual burglary occurs. Blackstone et al., 2005 evaluated alternative policies to combat false alarms and showed the desirability of having police dispatched only after a private security officer has physically verified the strong likelihood that a burglary has occurred or is in progress. This solution is termed verified response, since the private response company, usually a guard service or designee of the property owner, is required to physically inspect the premises prior to dispatching the police.

Verified Response (VR) which is a form of public-private partnership has been quite successful. In Salt Lake City (SLC), after verified response was introduced in 2000, police responses decreased from 9,439 in 2000 to 898 in 2001. 'Valid' alarms decreased from 64 to 5 during the same time period. The savings to police in officer time was 8,482 hours per year or $508,920 (Blackstone et al., 2005: 241). These savings were accomplished with no increase in the burglary rate and with a drop in response time to other high priority calls from 5 to 3 minutes. In addition, as a result of initial response by private security officers, the police apprehended six burglars out of only 720 police responses during the first nine months of the new ordinance

compared to five apprehensions from 10,200 police responses during 1999, before the new ordinance had been enacted. VR makes police response more prompt, increases apprehension of burglars, and heightens the deterrent effect of alarms, all without increasing the number of actual burglaries. A national study revealed that a combined private guard and subsequent police response yielded a faster service in real events than the still common practice of only police response (Hakim and Blackstone, 1997: 216-225). This solution amounts to implementing what are essentially "users' fees". Such a policy also satisfies redistribution criteria where only those that cause the false alarms pay while others in the community no longer pay for a service that yields no benefit to them.

In general, under the current situation where 94 to 99 percent of all responses are to false alarms, police justifiably act as if they are responding to a false alarm. Accordingly, they respond more slowly and less attentively than they could. Thus, in the 1-6 percent of actual burglaries, they will be less effective, possibly endangering themselves. If, however, police consider all cases as real, resources will be wasted, police will become frustrated, and lives endangered because of unnecessarily fast response. In either situation, VR will be beneficial.

Police shedding initial response has other positive effects. When police exclusively provide alarm responses, alarm owners are restricted to the response quality provided by police, are subject to the local ordinance that specifies the fines and other penalties, and are often perceived as miscreants who face court hearings when activations persist. With the introduction of VR, private guard companies will enter and consumer sovereignty will be introduced. Alarm owners become customers of their chosen private response company; they are able to choose their preferred financial package of response, and are perceived as customers rather than criminals. Indicative of the advantages of competition is the fact that alarm response time by private companies ranged from 5 to 20 minutes in 2003 in SLC compared to 40 minutes on the average in 2000 when police still responded. Cost of response decreased from about $60 for police response to an estimated $15 to

$20 for private response. Police, the court system, and the municipal administration saved resources by the conversion to verified response. After switching to this market approach, similar results have been observed in such localities as Las Vegas, NV, Eugene, OR, and Toronto, Canada.

The aggregate savings derived from eliminating police response to false alarms could be substantial. Since two or three officers respond with an average time of at least twenty minutes per call, elimination of such responses would free up thirty-five thousand officers nationwide who could be assigned to security activities with public good attributes like homeland security. In dollar terms, annual national savings are at least $1.8 billion.[8] In other words, since 425,000 officers regularly responded to calls for service in the U.S. in 2000, resolving the false alarm issue for police would add the equivalent of eight percent more officers who will become available for other security tasks.[9] Patrol officers are in fact fully employed with little slack, suggesting that output of patrol may increase nationwide by close to eight percent. A study of Indianapolis, Indiana patrol officers found that only one out of eight hours was spent on personal activities like lunch and restroom breaks during a typical eight hours shift. Six hours were spent on general patrol, encountering citizens or suspects, and traveling to specific destinations. Another hour was spent on problem directed activities like traffic enforcement, crowd control, or searching a crime scene (Parks, 1999: 497).

Even though patrol officers tend to be fully occupied, some of their efforts include provision of non-public goods. Resources expended in the provision of non-public goods could be used for the war on terrorism. Surveys of patrol officers' workloads in several communities showed that private services comprised 18 percent of calls for service. Paster (2003: 48) showed that 29 percent of patrol officers' time is spent on general patrol. Thus, 13 percent of patrol time is spent on non-public activities. Such services included police response to burglar, car and personal alarms, checking on the welfare of individuals, escorting funerals, assisting motorists with such problems as

flat tires, animal control, and providing civil standby service.[10] The savings from the elimination of these private services can be calculated. Thirteen percent of 425,000 patrol officers yield total savings of 55,000 patrol officers with nationwide annual saving for governments of $2.8 billion of which the elimination of response to false alarms comprises about 65 percent of the total savings (Table 1).

Another possible source of savings in police resources is crime related, but where diminished service of police will change business behavior. Police in many communities still chase drivers who do not pay for their gasoline, investigate cases of insufficient fund checks, and apprehend those who do not pay for their restaurant meals. If police reduce their responses or charge the real long run marginal cost for their service, merchants will make greater efforts to prevent the misdeeds. Service stations can install pumps that require prepayment, stores can verify account information more carefully, and restaurants can be more diligent in monitoring their customers (Scott and Goldstein, 2005). In practical terms, businesses are expected to take reasonable actions to mitigate their possible susceptibility to property crimes. In some cases the police already charge fees for the use of excessive police services. Halton, Ontario, police charged a dance club for the cost of maintaining safety and security in its neighborhood (Scott and Goldstein, 2005). Thus, police could eliminate some crime related activities that in turn will lead the private sector to adopt better security measures without increasing crime.[11]

Equity consequences of police shedding or pricing should be considered. Eliminating free police responses and implementing police long run marginal cost pricing could prohibit low income alarm owners and prospective owners from using or installing, respectively, their systems. If price elasticity of demand for poor alarm owners is high they will forego alarm use/ownership. If demand is inelastic, poor owners will spend a larger part of their income on alarms. However, the poor, like all alarm owners, will become more careful in preventing false alarms. Indeed, empirical evidence

suggests that alarms are price elastic (Hakim and Buck, 1992). Thus, imposing additional charges on owning and using alarms will have a significant impact on their purchase and retention. At the same time, income elasticity of demand for alarms is high as well, suggesting that higher income households bear a larger proportion of the consequences of the charges (Hakim-Buck Study, 1991; Hakim, 1995). Thus, imposing additional charges on alarm owners will have the greatest effect on wealthy residents.

Under the current system where alarm owners enjoy free response, police patrol concentrates on the wealthy homes which draw a disproportionate number of police responses to false alarms. When police cease response or charge long run marginal cost, patrol will be reallocated to the poorer sections of the city. Thus, our suggested policy for the largest portion of non-public good provision is both efficient and equitable in that the poor will benefit more.

The second category for savings of police resources includes contracting out those public good services that might be more efficiently provided under competitive conditions.[12] The conditions for outsourcing are quantitative measures of outputs, existence of such services by private or other public providers, and a public accounting system that enables cost estimation of the specific services that are being considered. Such an accounting system is termed Activity Based Costing (ABC system). Examples of such possible outsourcing include investigation, crime labs, traffic control, parking enforcement and administration, and vehicle and building maintenance. Inter-jurisdictional contracting out that captures economies of scale and scope may also be a viable option. Police departments of larger cities occasionally assume responsibilities for policing adjacent smaller jurisdictions (Mehay and Gonzalez, 1992). Privatization of police activities might save thirty percent of police costs (Hakim and Blackstone, 1996).

The shift of "traditional" services with private attributes from police to private security companies and the creation of public-private partnerships has the potential to have other far

reaching social benefits. The improved cooperation between private security and police should make the private companies more familiar with police practices and enhance relationships and interaction between the two sectors. In fact, the growth of private security employment is already expected to be faster than the average of all occupations between 2005 and 2010 (Bureau of Labor Statistics, 2004-2005).[13] Immediate benefits of cooperation could involve expanded training of private security guards in police academies, sharing of databases, and private security reporting to police on any irregularities in their domain. Private security companies are already connected to police channels and assist police in their activities. On the southwest side of Chicago private patrol officers assisted the police in 51 cases, participated in 48 arrest incidents, and recovered five handguns within a four month period (Pastor, 2003: 127).

Police must provide an adequate number of officers during an emergency for first response and support services, including crowd control, evacuations, and order maintenance. Homeland security incidents occur unexpectedly and the number of officers required is positively related to the seriousness of the incident. This is a typical peak load situation, which is very common for public utilities.[14] First response needs depend mainly on the number of police officers necessary in case of a HLS incident. This peak load problem is particularly acute in large cities where the expected damage can be high. In such a case it is possible to draw on private security guards whose regular function is in the realm of alarm response. Instead of enlarging police departments in order to meet peak load demand it is possible to train and assign private security officers for particular activities. Private security would then become essentially a reserve unit for HLS.[15] Private officers would be trained by police in procedures and techniques and their regular pay would be supplemented from HLS sources.

Fire Services

Fire departments respond to fires, gas leaks, bomb threats, flooding, rescues from perilous situations, and automobile accidents. Firefighters are an integral part of first response to HLS incidents as well. Rural and suburban localities rely mainly on volunteer firefighters while large cities rely on paid firefighters. Only 2,044 out of 30,310 U.S. fire departments in 2003 were entirely paid or career. Nationwide 73 percent of all firefighters were volunteers. In 2002, 89 percent of firefighters in communities of a million and more were all career compared with 17.6 percent for those protecting communities of 10,000-24,999 residents (National Volunteer Fire Council, 2005). Since our concern is vulnerability to terrorist incidents that are more likely to occur in large cities, our analysis centers on metropolitan departments.

The public good aspect of fire services is avoiding the spread of fire to adjoining properties. Historians and economists provide other reasons for the 19th century shift in the U.S. from private to public fire departments. Historians claim that battles between the private fire departments to receive the insurance company bounty paid to the department that extinguished the fire led to the shift. Economists, however, claim that public fire departments allow politicians to offer jobs, insurance companies to avoid payment of bounties, and firefighters to enjoy regular pay (McChesney, 1986). In any event, because of the swift spread of fire, the fire department must respond quickly even in the case of a suspicious fire alarm.

Two fire engines and a ladder truck along with a chief normally respond to each alarm. About 2.2 million out of a nationwide total of 3.8 million fire responses in 2003, or 58 percent, were to non-valid alarms. Fire departments consider valid alarms to include responses to automatic activations resulting from steam from a shower or burnt food. However, if there is no fire then we consider the situation to be a false alarm. Accidental activations are responsible for an average of 24

percent of total U.S. false residential fire alarm activations (Finley, 2001: 31). Malfunction of fire alarm systems causes on the average 31.2 percent up to a maximum of 90 percent of residential fire alarm responses (Finley, 2001:31). In any event, the national 58 percent figure will be used for the cost estimation of false alarms.

The false alarm problem is amply illustrated by some examples. False residential fire alarms in Vineland, N.J., occurred primarily because of smoke from cooking or burnt food (57 percent) and alarm system malfunctioning (19 percent). Finley (2001:31) reported that only three percent of alarms are for actual fires. In Salt Lake City, in excess of 99 percent of the annual 2,500 automatic fire alarms to which the fire department (F.D.) responds are false (Fire Alarm Ordinance Summary, 2005). In Saint Joseph, MO, in a six months period, there were 36 false fire alarms emanating from a single user's overly sensitive smoke and heat alarm system. Because of that experience the City of Saint Joseph charges after the 6th false fire alarm in any calendar year; the 7th through 9th false alarms are charged $50 each and after the 10th, $100 each (Raletz, 2005). False alarms typically cost the fire department $350 per activation, or $2,100 for the six responses for which no revenues are collected (SLC, 2005).

Users are not concerned if they have only a few false alarms over the course of the year. However, the fire department (FD) incurs the real cost, and non-activators of alarms finance the service from which they neither gain nor receive any benefit. All additional responses in the above situation are clearly provided below cost, thus also providing insufficient incentives to discourage false alarms. Because of the magnitude of false responses, the Saint Joseph fire department responds with one engine at non emergency speed instead of its previous policy of multiple engines at emergency speed.

Unfortunately, in the case of both fire and burglar alarms, public response tends to be unrelated to real cost. Many communities usually provide three free burglar or fire alarm responses.

A survey found that out of 67 medium sized city fire departments, 37 did not utilize any fines or penalties for repeat false fire alarm activators (Finley, 2001:52-53). Because municipal facilities, public schools, and charitable institutions are often exempt from charges, they tend to have a large number of accidental false activations. For the same reasons that we outlined in the previous section on police, the policy of not charging the full cost for false alarm response is inefficient and inequitable. Response to a false alarm is a private service for which the activator of the false alarm should pay. It is essential that all false activations are charged at real long run marginal cost. Even when the request for response is from a municipal property, budget transfers that express real cost should be made from the activating agency to the fire department to encourage appropriate precaution. Also, if real costs per response of the fire department (including normal profit) are paid then activators would not be treated or perceived as criminals. A service is rendered and a market price is paid. The price should reflect cost to the agency and not, as some claim, the cost that would prevail under market conditions. This will provide incentives for private or public competitors to enter the business.

There is another reason why real cost should be charged for false calls. Budget al.locations to fire departments are often determined by the total number of responses, including those that are false. Each dispatch for service promotes an increase to the budget. Also, fire commanders like their firefighters to respond, to avoid boredom, even when the probability of a false activation is high. This leads to larger fire departments than necessary. Thus, by charging activators for the false alarms, the upward budget adjustment for false activations is eliminated, and the public is relieved from unjustified charges.

The attributes of fire and burglar alarms differ. In the case of a bona fide fire alarm, prompt response is crucial since fire can spread aggressively throughout the neighborhood and cause severe personal injuries and property damage. Verified response is a preferred solution to the false burglar

alarm problem while it cannot be as easily applied in the case of fire alarms. The National Fire Protection Association (NFPA) has established a standard for residential alarms whereby the monitoring facility may verify if done within 90 seconds. In fact, most fire departments respond promptly with no verification. The NFPA standard requires that 90 percent of fire department responses must be within six minutes. However, the high rate of false alarms has led fire departments to alter the extent of the response. Since physical verification may be problematic, the rate of false alarms is high, the number of alarm systems has been growing at the rate of ten percent a year, and fire departments budgets remain constant in real terms, then either the extent of response must be limited (one engine) or higher fines must be assessed.

The social cost of response to false fire alarms can be estimated. The average cost of fire department response in the 2003 to 2005 period ranged from $365 to $1050 (SLC, 2005; Romeo Observer, 2005; Philadelphia Fire Department, 2006). Thus, the estimated annual nationwide direct cost ranges between $800 million and $2.31 billion.[16] An additional cost of responding to alarms is the loss of life, injuries, and lost property caused by accidents involving fire engines en route to the scene. Approximately 20 people are killed annually in fire vehicle accidents. (U.S. DOT, 2004: 94). Since false activations make up the majority of FD responses, it is plausible to assume that a majority of the twenty died as a result of false activations. The average estimated value of life is $13.3 million (Kuchler and Golan, 1999: 48). Assuming conservatively that only 50 percent (rather than the actual 58 false alarm rate) of the deaths occurred as a result of false alarms, the social cost of false alarms, excluding injuries to civilians and to firefighters and property damage, is in the range of $930 million and $2.4 billion.[17] The average 2002 annual salary of a firefighter, including fringe benefits, was $50,000. Thus, solving the false alarm problem would add between two and slightly more than four percent to the 1.1 million firefighters in the U.S. or 19,000 to 49,000 additional firefighters. Since the largest number of false alarms occurs in large cities, the vast

majority of the firefighters will become available where homeland security resources are most needed. Moreover, these are full-time firefighters so that the increase is far more significant than the numbers indicate.[18]

It might be possible to introduce markets to fire department operation that could save resources and/or improve efficiency without unnecessarily raising risk. Since false alarms constitute the majority of calls, fire departments should charge their long run marginal cost of response which ranges from $365 to $1050.[19] Assessments for false alarms should include system malfunction and excessively sensitive systems. Charging real cost is justified on both efficiency and equity grounds. False fire alarm fines which are higher than the burglar alarm fines will probably have a greater impact on reducing false activations.[20] Charging activators will encourage development of new technology and indirectly enhance competition among central stations to verify alarms within the ninety second standard.[21] Specifically, it will encourage the development of improved sensors and adoption of artificial knowledge in sensors.[22] It will also promote technological solutions to reduce verification time.[23] Real cost pricing might even encourage competition by private companies entering and offering first response services. In order to become competitive, private responders will have to deploy less expensive firefighting vehicles. When needed, larger fire department engines from the public fire department can be called to the site. Entry of first responding private fire departments could relieve public fire departments of some of the false alarm problem. In addition, the collected fines will enable fire departments to enhance other services including preparation for HLS.

HLS can be enhanced by shifting resources used for responding to false alarms and possibly by developing mutually beneficial public-private partnerships. HLS efforts of the fire department, like the case of police, must satisfy peak time demand during a terrorist event. Communities could establish reserve forces of private firefighters from such industries as chemicals and oil to be used

in emergencies. These firefighters can be prepared for emergency situations and be compensated as auxiliary public firefighters.

The negative externality nature of fire suggests that public funding of fire departments is justified. At the same time, public funding does not mean that public production is required; fire services could be contracted out if there are more efficient providers. Most outputs of fire departments are tangible and thus could be contracted out to both emerging private companies and to other public jurisdictions. Introduction of competition to replace public monopolies in the provision of fire services might be a source of additional savings to local governments that could be shifted to HLS.

Ambulance Services

Ambulance services are provided by both private companies and by local government agencies that are usually part of the fire department. Total employment of emergency medical technicians (EMTs) and paramedics in 2002 was 179,000, of whom 40 percent work in 3,485 private ambulance service companies, 30 percent in local fire departments and other public ambulance and emergency medical services agencies, 20 percent in hospitals, and the remainder in various industries providing emergency services (Bureau of Labor Statistics B, 2004-2005). In addition, there are many volunteers in mainly non-major metropolitan areas; however, no data exist on their activities.

The cost of false emergency responses by ambulance personnel can also be estimated. Ambulance services operated by public fire departments provided 13.6 million responses in 2003, double the number reported in 1987 (NFPA, 2005). Since public fire departments comprise 40

percent of the ambulance industry, the number of emergency ambulance responses nationwide would be about 34 million.[24] The percentage of unneeded ambulance service is substantial. A U.S. Government study found that for 67 percent of Medicare reimbursed ambulance trips that did not result in emergency room treatment or hospital or nursing home admission, alternative transportation would not have endangered patient welfare (Inspector General, 1998: 5, 10). As a specific example, 33 percent of Cincinnati's emergency ambulance responses are estimated to be for non-emergencies (Prendergast, 2003). Only 25 percent of nationwide 911 medical calls are a true emergency (Dann, 2005). It is likely that the actual percentage of false calls is higher because of the difficulties in determining what is false. Experience in Israel showed that 18.5 percent of all ambulance responses were cancelled after the ambulance had been sent or where the ambulance team could not find the patient. This is just a portion of all false ambulance calls (MDA Ambulances, 2005). It is commonly alleged that some call an ambulance for what is really non-emergency transport to the hospital. Those without cars, funds to pay for a taxi, or health insurance can obtain faster care by use of the 911 system. Those with insurance will bear a small portion of the cost and those without insurance probably believe they will not have to pay at all.

The real cost of an ambulance dispatch based on Medicare payments for 1996 was $316; in Toronto it was $300 U.S. dollars in 2005 (Inspector General, 1998; EMS, 2005). An estimate of the cost of false response is $100.[25] A conservative estimate is that 25 percent of emergency responses or 8.5 million are unnecessary. Thus, nationwide false ambulance calls cost $850 million plus the cost of fatalities, injuries, and property damage. Considering only the cost of the 21 fatalities occurring as a result of emergency ambulance accidents yields a cost of $66 million. Thus, the total social cost of false alarm responses is about $916 million annually. Solving the false alarm problem for ambulance services could free up the equivalent of 18,300 paramedics (Table 1).

The ambulance equivalent to physical verification in burglar alarms would be to screen calls for service. One possible screening approach is to include a paramedic in the emergency response center that investigates whether an ambulance is necessary, provides advice, and might indicate to the caller the price involved when an ambulance is dispatched (Johnson, 2002).[26] Such a practice could yield a reduction in ambulance responses.

Introducing competition to the ambulance market might well improve efficiency. There is already some evidence that competition between public and private providers lowers prices and improves service. For example, in Pinellas County, Florida, a private company (Sunstar) won the contract over a government provider to handle the emergency and non-emergency ambulance services. It has cut emergency response time by 30 seconds and upgraded the equipment, and it is projected to save the County between $13 and $21 million over the decade (Reason, 2006). In general, private ambulance firms have more sophisticated equipment than public providers. Seventy percent of private providers have defibrillation devices for heart attacks compared to only 48 percent of public ambulances. Further, 48 percent of ambulance companies use automatic vehicle locators compared to 20 percent of city agencies. Finally, private paramedics earn only 75 percent of what their public counterparts earn (Johnson, 2002).

When comparing private to public ambulance service, private companies perform at lower cost and use more sophisticated equipment and technology while some evidence suggests faster response time as well. This finding is consistent with the fact that firms operating in a competitive market are often more efficient than government monopolies. A solution often used by localities is to contract out service to private companies for a few years. Maintaining the contract requires meeting performance targets like response time. This solution introduces competition in price setting at bidding time. However, the possible lack of a sufficient number of companies bidding for the service and the granting of monopolistic power for the contract term raises some troublesome

issues. Nevertheless, such a contract term provides an incentive to improve performance beyond the targets specified in the contract.

In order to use ambulance services efficiently it is imperative that all users of ambulance service are charged their full cost. Introducing market pricing to public ambulance services will yield a more conservative use of the service. Patients that are not in critical condition and do not require ambulance service will use another mode of transportation to get to the hospital. Government then does not bear the expense for non-public services, and patients are deterred from unnecessarily calling for an ambulance. Introducing full cost prices for public ambulance services will encourage entry of private companies to this market. If public ambulance providers wish to remain in business they will be forced to become competitive with the private sector. Managed competition allows the public provider to deliver the service if its prices are competitive. Clearly, a necessary and sufficient condition for managed competition is that the public ambulance service becomes a profit center without allowing cross subsidization from the public fire department.

Ambulance services are private goods that do not require public intervention. We recommend that instead of maintaining a public service monopoly, private companies should be allowed to enter the market. This can be done by government shedding the service and allowing private firms to enter. Alternatively, if the constituents and government ambulance workers wish that public service persist then government should set prices at long run marginal cost while avoiding cross subsidization from other government agencies (e.g. fire department). Allowing consumer sovereignty where customers can choose an ambulance company that best reflects their preferences is normally preferred to establishing a private monopoly under contract. However, given the emergency nature of most ambulance services that precludes shopping, contracting out through competitive bidding would yield most of the benefits. It is possible, however, that patients who are in life threatening condition will not call the ambulance due to cost consideration and as a

result may suffer serious consequences and even die. The social cost of our suggested policy might well then be too high. Only a detailed study could show whether such a concern is valid, its extent, and its estimated social cost. In any event, the community may choose that all constituents should have access to emergency medical transportation as is the case for hospital care.

There are some practical problems in the implementation of this approach. Both Medicare and Medicaid reimburse at their own set rates for ambulance services, even in the case of false calls. Such a practice reduces the deterrent effect of full cost prices. It is imperative that the patient pays the full amount for the ambulance and then justifies the emergency nature of her case in order to be reimbursed for the expense. In fact, communities often have difficulty collecting ambulance charges. For example, Cincinnati only collected $3.4 million out of $7.9 million in charges in 2002 (Prendergast, 2003)

Political Barriers to Efficient Solution

Why is the economically efficient burglar alarm policy, verified response (VR) or pricing at long run marginal cost, seldom implemented even though the value of such policy seems evident: lower cost of service, often better service resulting from reliance on competition and markets, and minimal role for government?

In competitive markets, consumers strive to maximize utility and producers to maximize profits. These incentives lead to a market solution that is socially optimal. Such incentives unfortunately are lacking in the case of emergency services. There are two blades to the scissors: Free or nominally priced responses to false alarms means that alarm owners have little incentive to

prevent them. Concerned with increasing their sales, alarm companies want to continue free police response, in effect receiving a subsidy for the service that they are selling to their customers.

Most burglar alarm owners falsely activate their system 1.4 times a year, and most communities allow 3-5 such free activations a year. Most alarm owners, therefore, do not incur charges for false alarms. Even the repeat activators like schools, municipal facilities, and religious institutions are exempt from charges, and others like banks treat the charges as a normal business expense. Thus, under police response, false activations do not reduce consumers' purchase and operation of their systems and have no negative effects on alarm companies' business practices. Central stations that could better verify activations lose nothing by dispatching police even when a high likelihood exists that the alarm is false. They do so in part to avoid being subjected to litigation in the remote case of an actual burglary.

Overall, residents of the community are not concerned about false alarm cost because the financial impact on each resident is negligible. For example, in Salt Lake City, the per capita savings from solving the false alarm problem is less than $3 a year. On the other hand, alarm owners could each lose $70 a year, and alarm companies may lose potential sales of systems if police response were eliminated. This is a standard economic principle where per capita effects are important in understanding how a small group like the alarm owners or industry has the incentive and ability to obtain favorable regulatory policies (Peltzman, 1976; Olson, 1965). The only players that have an incentive to reach the efficient solution are the public emergency agencies, but unfortunately they depend on policies and ordinances enacted by the public policy makers.

Local legislators who could implement socially efficient solutions are driven by self interest incentives. They prefer not to challenge the status quo that could cause political problems. Support for change may yield a political setback for politicians while the support of current practices has no negative effect. Also, the alarm industry prefers the status quo since police respond to their

customers, generally for free. The alarm industry is concerned with the possible spread of VR and pricing response at cost and therefore lobbies against adverse changes in practices and ordinances. Thus, unlike the case of competitive markets, no player has an incentive to reach the efficient solution.

For example, in 2003, the Police Chief in Los Angeles, like his predecessor, tried to implement VR. The alarm companies responded with thousands of letters to their subscribers, requesting them to contact their City Council representative, and mobilized neighborhood advisory panels and business owners to oppose the suggested policy. The local alarm association also hired a lobbyist to promote its interests. The alarm industry was successful in changing the policy to two free false alarms a year before VR was required. In the end, the six percent of LA households with alarm systems was able to impose their cost on the remaining 94 percent without alarm systems. In effect, the alarm industry and alarm owners imposed $6 million of cost on the LAPD's annual budget for providing a private service, which amounts to a per capita expense for those without an alarm system of almost $2 a year. The six percent of the population who are alarm owners are beneficiaries of a per capita gain of $27 or $78 per household.

In approximately 30 communities the practice and/or legislation for VR was adopted. The main force promoting the change was the existence of a champion that promoted it with little regard to possible negative personal consequences. In both SLC and Fremont, CA, the police chiefs championed the process by convincing their City Councils of the savings that would accrue to the police department and the improved police response to other high priority activities, all without an increase in burglaries (Salt Lake City Police Department, 2006). Success also seems to require that the political effort is made long before the elections.

Discussion

Questions of productive efficiency aside, a critic might say that at the time of a HLS incident all resources necessary for emergency response services are shifted to it from normal activities. Thus, reducing false emergency calls and eliminating other non-public good services will have no impact on the ability to respond in the event of real emergency. Further, critics may also claim that freeing up emergency resources will not improve HLS because resources are already not being fully utilized. Thus, additional "routine" demand for HLS has negligible opportunity cost. Finally a cynic might argue that the budgetary savings realized from our proposal will be appropriated by other government agencies and not directed to the agencies responsible for emergency response activities ranging from fire and burglary to HLS.

HLS efforts include preparation, response, and recovery activities. Kreps (2006: 86) stated that emergency preparedness involves developing plans and procedures, recruiting and training personnel, and acquiring facilities, equipment and materials. Indeed, training of emergency personnel, educating the public, developing interoperable communication systems, purchasing and training with robots to dismantle bombs, developing protocols for various possible incidents are only few examples of routine HLS preparation activities that take place on an on-going basis.

A significant financial investment in HLS that takes place in non-emergency times is on the development and application of internet based emergency management programs. Information Technology (IT) companies have been developing computerized maps for critical infrastructures and disaster prone areas. Such 3D maps include engineering and architectural plans for buildings, Geographical Information Systems (GIS) mapping for all utilities, construction activities that take place, and contact information for key personnel. Photographic, chemical, and radiological monitors are spread throughout the critical area in order to provide accurate and timely information in a crisis

situation. Development of such programs requires long term joint efforts of IT experts, emergency personnel, and public decision makers. Simulation exercises are conducted in major cities to test the reliability of these programs. These exercises are partially funded by $280,000 grants from the US DHS and are locally designed and conducted (US DHS, 2003). Efforts are constantly made to update the data, and improve the program's performance. The management of crisis situations requires the use of reliable communication channels where the individuals "attending" the conference calls may vary. Quarantelli (1986) points out the importance of developing good communications and notes that prior planning can eliminate many management problems that occur in disasters. Since emergency personnel often communicate over different radio and internet based channels, efforts are made to enable a secure and reliable communication channel at the time of emergency. Indeed, resources could be expended on development of interoperable communications systems. Absence of such communication system could lead to severe failure of response and recovery efforts. Since these resources are expended by public emergency agencies, shedding some of their services and contracting out others may release resources that could be used for such developmental and preparatory activities.

Further, resources freed up from non-public goods activities could be used to hire specialized experts to help prepare for terrorist threats involving weapons of mass destruction (Perry and Lindell, 2003: 341). New York City in 2002 began to spend more than $200 million annually on intelligence gathering and preparations for terrorist attacks. The City hired civilian analysts to identify trends that might indicate heighten threat of terrorism, provide security advise to private operators of strategic infrastructures, conduct security sweeps of potential targets, educate police officers on detecting chemicals that could be used in explosives (Flynn, 2007: 105-106). Experts could also help in physical planning of neighborhoods to incorporate easy accessibility for emergency services and develop building codes to make structures more resistant to natural

disasters or terrorist acts.[27] The aftermath of Rita and Katrina showed the devastating results of insufficient preparations for disaster. In the Mexico City earthquake of 1985, Kreps (1998: 39) showed that the lack of prior planning inhibited timely and effective response and recovery. Mundane activities like response to false burglar and fire alarms or escorting funerals have no training component helpful for HLS. Freeing the police from such responsibilities that have little or no public good aspects could be beneficial in building and strengthening HLS efforts.

The perception of idle capacity of patrol officers is common among casual observers. As stated in section 3, Parks et al. (1999) showed that insignificant slack existed. The inherent difficulty of quantifying the output of patrol, including crime deterrence and prevention, produces the perception of such slack, so the issue of over capacity is a speculative criticism of the recommendation made here.

In the case of ambulance services a real emergency requires the consumer to make an immediate decision about which service to contact. The main decision variables are speed, quality, and price of response. Clearly, this does not permit adequate time for engaging in search and may justify the managed competition or contracting-out approaches. Unfettered competition would be problematic because private providers face consumers who are unfamiliar with the available providers when an emergency occurs. Private providers can try to overcome the problem by soliciting customers through pre-subscription. The 911 operators could provide information to the consumer and then summon an ambulance from a pre-approved list of eligible providers. In any event, contracting out ambulance service as done in Pinellas County, Florida could achieve most of the benefits of competition.

Another issue concerns the possible under-use of emergency services. We suggested that private use of emergency services should be charged to the users. For example, the actual cost of an ambulance should be charged in order to avoid over-use and probable abuse of public resources.

This, however, could ultimately lead to greater social cost. Charging for ambulance response for what appears to be a minor case may mean that individuals will avoid calling the ambulance. The result could be a more severe and costly medical procedure at a later time. This is a typical behavior in situations of imperfect information where non-optimal activities could result. This by itself does not justify public financial support for a private service. Assuming rational behavior and adequate information, the individual will realize that postponement of a medically necessary procedure could lead to worsening of his health condition and thus will either pay for the ambulance or find some alternative way of getting to the hospital.

In all three emergency services we recognize the possibility of non-response to an actual emergency as a policy alternative. If public emergency response ceases, private response will fill the gap. In fact, under the current situation, non-response could occur simply because emergency services are strained responding to non-emergency calls. With respect to police, in most communities, police respond to burglar alarms at low priority. This is true even for the case of real burglary since no a-priori information is available whether the case is false or real. For example, in SLC average response by police took 40 minutes in 2000 (Blackstone et al., 2005). Police in Chicago, New York, Los Angeles, and dozens of other cities respond to burglar alarms at low priority; and response could take an hour or longer (CBS News, 2003). The question is whether public or private response time and quality differ for real events. When private guards respond to their clients' activations, the responses are fast and in case of real break-in police are dispatched and respond at high priority. In SLC, for example, private guards respond within the range of 5 to 20 minutes (Blackstone el al., 2005). The data from SLC and other places support our assertion that in case of a real burglary, response time and quality will improve when police adopt the VR practice. Similar considerations apply to other emergency services. For example, reducing response to false ambulance calls will permit faster response in case of a true emergency.

Another issue is whether the charge should be on the basis of average variable cost or long-run marginal cost. If the service requires expansion of the police force, which is a fixed input, then long run marginal cost pricing is appropriate. If the provision of private services simply extends the existing use of the force then average variable cost is justified. The conditions for police provision of the service are openness for entry by other entities, charges that relate to the level of service rendered, and no cross subsidization among police services.

The possible existence of economies of scope raises the issue that elimination of non-public services could diminish cost insignificantly. This is especially likely in small jurisdictions where response to all emergencies permits lower cost delivery of other services. Economies of scale or scope might then create a monopoly provider in the provision of, for example, ambulance services. The key, however, is to require that price at least cover marginal cost, allowing for competitive entry.

When services are shed or contracted out, a private monopoly may replace the government monopoly in small suburban/rural communities because of the small number of customers. This could lead to inefficient production of service and/or reduced consumer surplus to the users of the services. The resulting public policy question is then whether it is better to retain public provision where greater control of the level and quality of service exists. Economists often suggest that government could retain the service as long as it charges its own long run marginal cost and provides no free service. As long as no free service is provided and there are no government created barriers to entry, a most efficient provision will result. Contracting out can achieve many of the benefits of competition provided that a sufficient number of competitors vie for the contract.

This paper focuses on efficiency matters. However, one should not overlook an equity implication of our recommended privatization of emergency services. When government ceases the provision of service, it is possible that entering private providers will "cream skim" by serving the

more affluent constituents, leaving poor neighborhoods unattended. However, differential quality providers will probably serve the various markets. This will likely increase efficiency, but may create the same equity issues that are true for most goods and services; however, this is beyond the scope of this paper.[28]

Conclusions

The Rudman Report indicates that local and state governments require an additional $98 billion over five years, or $19.6 billion a year, just to reach the minimum level necessary for adequate first response to terrorist attacks and natural disasters.

Response to false calls to police, fire, and ambulance services is a significant drain on these departments' resources. False alarms comprise ten to twenty percent of all calls for police service while 94-99 percent of police responses are to false calls. The average cost to the police ranges from $60 to $100. Non-valid fire responses constitute 58 percent of all responses at an average cost of $365 to $1050. False ambulance responses comprise 25 percent of all calls and cost on the average $100.

If the problem of false alarms and other private services provided to the community by police, fire, and ambulance services is resolved then each year $4.65 billion to $6.159 billion or 23.7 to 31.4 percent of the required additional annual spending necessary for HLS preparedness can be found at the local level. Alternatively, between 88,000 and 122,000 police, fire, and ambulance first responders could be shifted from responding to false alarms and provision of some non-public-good services to HLS activities.[29] Table 1 provides a summary of these estimates. This is a conservative estimate of savings of first response services; it excludes other non-public good

activities currently provided, and the cost of injuries and property damage to both the teams responding to false calls and to third parties caused by accidents while en route. It also does not incorporate benefits of increased competition or the shedding of non-public goods provided by fire departments.

It is important to search for ways to reduce the provision of other non-public-good services, primarily in the area of police services. In addition, some savings might be generated by contracting-out those public-good activities that could be provided more efficiently through competition. The first group includes the response to false alarms, police escort of funerals, and provision of animal control. Here government's shedding of the service will enable the private sector to enter; usually the result will be a more competitive environment. The second group includes services that already exist in the market. We recommend the use of managed competition, which is a term used where government employees are allowed to compete on a "level field" with the private entities. Services can be contracted out to profit or not-for-profit organizations or retained by government if it happened to be the most competitive provider.

A third source of savings for state and local governments entails greater mobility and flexibility of emergency services and reduction of slack from both public and private sources. Peak time demand characterizes emergency response. Private security forces could be trained and prepared for emergency situations and be assigned for pre-defined obligations. Government financial support could be provided for emergency reserve units of private security, fire, and ambulance services. When emergency conditions prevail, additional emergency resources can be drawn from other jurisdictions or private entities. Federal subsidization of state and local governments can mandate the shift of emergency personnel and equipment across state borders in case of emergency conditions. For example, when the Katrina and Rita natural disasters occurred and the local police force eroded as officers were busy rescuing their own families, out of state

jurisdictions could and did send security forces. Public private partnerships could be utilized for emergency conditions also. Private providers can be assigned emergency tasks for their personnel, vehicles, and equipment. It is not inconceivable that security executives will be prepared and assigned to leadership positions for emergency situations.

Limited real world observation shows that police and fire departments often provide services that are private in nature. Long term provision of such services may make them seem justified to both local policy makers and constituents. Other public goods might be contracted out to other jurisdictions or private sector providers to achieve savings. Contracting out requires estimates of existing costs by function for the public jurisdiction. Noteworthy is the fact that current accounting practices of communities often prohibit estimation of the cost for services that could potentially be contracted out. Thus, the public agencies should transform their accounting system from agency-wide to an Activity Based Costing system in order to strive for socially efficient solutions. In any event, our study suggests the merits of continuing efforts to verify and possibly refine our findings and recommendations.

This paper suggested that social welfare in the provision of emergency services could improve if government sheds services that are private in nature and contracts out services that could be improved under market conditions. Market conditions include local governments competing along with private entities. This solution does not consider the possibility that some individual cases could be better served through government provision. For example, charging all callers for ambulance service could harm those individuals that will not call for service. Also, efficient solutions will not necessarily produce equitable solutions. In fact, reliance on markets could yield situations where the conditions for the poor worsen and may suggest adoption of compensation schemes. The question is the extent of such undesired consequences. Clearly, a detailed empirical

study is necessary to test both whether efficiency conditions indeed prevail and to measure the

extent of any inequity consequences.

Notes

[1] Similar false calls including totally hoax calls beset the U.S. Coast Guard. The problem of false calls is thus even more widespread than our estimates indicate. In any event we do not include the Coast Guard in our estimates because this paper focuses on state and local services.

[2] These services incorporate insignificant externalities and are private in nature. In the case of minor accidents, traffic may be blocked for a brief period of time. However, since both cars are drivable, they may just move to the shoulder of the road. Police shedding will encourage private providers for all these services. For example, participants in the case of minor accidents may hire an investigator to assign blame. Also, existence of scope economies may encourage providers to offer a host of services, including response to burglar alarms, escorting funerals, vacation services, and more.

[3] Vector Security employed enhanced call verification among other practices to reduce the rate of false dispatches from 1.37 per system a year to 0.8 (Goldfine, 2006a: 32). In general, central station verification is insignificant in reducing false police response since canceling a valid alarm exposes the central station to liability problems.

[4] Besides response to burglar and fire calls, other examples include gas odors, stray animals, and flooding occurrences. More specifically, when a 911 call comes in and the ambulance is dispatched, the driver does not know if it is a true emergency. Only after arriving at the scene can it be determined if a call for service is a real emergency situation. Some who lack health insurance and require non-emergency medical service use ambulances to reach the hospital, expecting not to be denied care through arrival by an ambulance.

[5] For example, Peltzman (1975) argued that making seat belts mandatory and requiring automobile makers to install other safety features may contribute to less cautious driving that in turn leads to accidents, harming innocent drivers and pedestrians as well as the risk taking drivers themselves.

[6] For example, the terrorist attacks of September 11, 2001 have led the Long Beach, CA police department to create both terrorism and special port units. These increased burdens have forced the department of 1,000 officers to reduce foot patrols and narcotics enforcement (Pomfret, 2006).

[7] For example, Milwaukee, WI in 2003 had a false burglar alarm rate of 96 percent on 28,346 calls (Schwartz, 2004). Seattle reported a 98 percent false alarm rate between 2001 and 2004 (Brooner, 2004). Chicago experiences annually a 98 percent false alarm rate and Salt Lake City in 1999 had a 99.7 percent rate (Sampson, 2001). A detailed survey of alarm owners in three localities in Pennsylvania has reached the same conclusion (The Hakim-Buck Study, 1991). For False Fire Alarms, see NFPA, 2005.

[8] They are annually about 36 million false burglar alarms (Blackstone et al. 2001) and with an average cost of about $50 per alarm call (Blackstone and Hakim, 1996) cost would be $1.8 billion.

[9] Seattle WA reports that between September 2001 and December 2005, it will have spent from the City budget sources $45.5 million on HLS. Also, the Seattle P.D. created a HLS section by transferred officers from other functions within the department. It created a chemical, biological, radiological, nuclear, and explosive unit among other activities. The costs to Seattle do not include the additional security for athletic events (City of Seattle, 2005). Further, William Bratton, the current police chief in Los Angeles and former chief in New York City points up the high opportunity cost of false alarms in terms of other more valuable police activities (Goldfine, 2006b:46).

[10] A similar study of patrol officers in Australia found that they spend eight percent of their time providing community assistance services like retrieving keys from fired employees, assisting homeowners obtain entry into their own homes when they are locked out, and delivering eviction notices to renters (CJC, 1997). Checking on the welfare of individuals is a private service because most cases prove to be unfounded.

[11] Police in many small, suburban communities prefer to retain such non-public services including alarm response. Economies of scope among various police activities are more prevalent than in large cities. Managed competition where police could provide services that are private in nature as long as entry of private or other public entities is not prohibited by below cost pricing or regulatory policies is an appropriate solution.

[12] Private law enforcement competes effectively against public law enforcement in the realm of bail bond absconders (Helland and Tabarrok, 2004). For a general discussion of privatization of police services, see Benson, 1998.

[13] Executives for the industry could be drawn from retirees of public law enforcement agencies, further improving cooperation between the public and private sectors.

[14] For example, electrical facilities are constructed to satisfy peak load times (e.g. late afternoons in the summer).

[15] San Francisco, CA has private police officers who in effect act as public police (Benson, 1998: 86-87). The City of Boston, MA developed a volunteer medical organization to provide mass care in disaster situations. A detailed plan, training and exercises have been conducted to assure smooth operation when employed (Menino, 2008).

[16] The nationwide cost is 2.2 million false alarms x $365 or $800 million. If $1050 is the cost per alarm, the estimated cost becomes $2.31 billion. In any event, the cost of fire department response is high. Calculations by the Philadelphia Fire Department show that in 2005 response cost was $1,053 per incident, excluding the cost of equipment (Philadelphia Fire Department, 2006). Accordingly, our estimates are conservative.

[17] Our estimates do not include the existence and the social cost of injuries resulting from response to false alarms. In just one incident, six people were injured when a fire engine collided with a car while responding to a false fire alarm (Toy, 1995).

[18] The cost of response to fire alarms is expected to rise in most non major cities where volunteers primarily provide all fire related service. In general, dual career families, the fact that residents often work far from home, and child care responsibilities are making it more difficult in most communities to attract non-paid volunteers, and repeated false alarms make volunteers reluctant to continuing their service (Mason, 2006).

[19] This conclusion arises because at higher prices (fines) price elasticity of demand is greater.

[20] This statement requires two plausible assumptions: price elasticity of demand for false alarms exceed zero and similar demand functions exist for false fire and burglar alarms.

[21] Markets usually provide incentives to produce efficiently, including the encouragement for technological improvements. When, for example the price of energy increases, consumers are inclined to purchase energy efficient vehicles and appliances, and manufacturers have incentives to develop more energy efficient products.

[22] Firms devote substantial efforts to better their rivals in terms of new products that satisfy consumer desires (Scherer and Ross, 1990: 613-660). For specific work on fire sensors and control developments see Bushby, 2001.

[23] Incidentally, we already witness better and faster verification in large central stations that employ improved receivers (Based on discussions with the president of Vector Security, Pittsburgh, PA).

[24] This calculation is substantiated by the experience of the Province of Ontario, Canada. The number of ambulance responses was 1.6 million in 2004 for a population of 12.4 million (Ontario Ministry of Health and Long Term Care, 2005). Maintaining the same ratio of one response for every eight residents would yield 35 million ambulance responses in the U.S.

[25] Response to a false ambulance call includes two paramedics and an ambulance for an average of one hour. We take the average paramedic salary including fringe benefits to be $50,000 a year. Ambulance response with paramedics in 2005 cost the Philadelphia Fire department $146 per incident, excluding the cost of the ambulance itself (Philadelphia Fire department, 2006). Accordingly, our estimates of ambulance response are conservative.

[26] A total of 35 died as a result of ambulance accidents but only 21 white red lights were blinking and sirens were sounding (U.S. DOT, 2004:94). In fact some emergency response may occur without lights or sirens so our use of 21 is conservative. We shall assume that one out of 5 were the result of false calls.

[27] Design of neighborhoods in a way that that minimizes crime incidents has been developed by Oscar Newman (1996). Newman's creative ideas are implemented by city planners around the world. Similar efforts could be made in reducing the costs of terrorist attacks through use of resources freed from provision of non- public goods.

[28] A similar phenomenon exists in state and local implementation of privatization ventures. A study by the Government Accounting Office (U.S. GAO, 1998) that surveyed privatization implementations suggested that the most important success factor is the existing of influential mayor, governor or council members that champion the effort.

[29] The Coast Guard is also subjected to false emergency including hoax calls to which it responds. Hoax calls alone comprise 25 to 36 percent of all calls. Conservatively, there are annually ten thousand hoax calls alone at average cost of $15,000 for a total of $150 million. One search based on a false distress call in the Seattle area cost $194,587 (Spivak, 2004). However, even though the Coast Guard provides emergency response, it is not part of this paper that centers on services that are under the control of local governments.

References

Benson, B. L. 1998. *To Serve and Protect: Privatization and Community in Criminal Justice*, New York, NY: New York University Press.

Blackstone, E. A. and S. Hakim. 1996. *Police Services: The Private Challenge*, Oakland, CA: Independent Institute.

Blackstone, E. A., A. J. Buck, and S. Hakim, 2005. 'Evaluation of Alternative Policies to Combat False Emergency Calls', *Evaluation and Program Planning* 28: 233-242.

Blackstone, E. A., S. Hakim, and U. Spiegel. 2001. 'The Economics of Crying Wolf', *The Milken Institute Review* 3: 40-46.

Brooner, J. 2004. 'Seattle to Impose Security Alarm Fees, Citing too Many False Alarms', *The Seattle Times*, November 24, 2000 U.S. Department of Justice.

Buchanan, J. M. 1965. 'An Economic Theory of Clubs', *Economica* 32: 1-14.

Bureau of Justice Statistics. 2002. 'Census of State and Local Law Enforcement Agencies, 2000',
Bulletin of the BJS October. U.S. Department of Justice.

Bureau of Labor Statistics. 2004-2005a. *Occupational Outlook Handbook*, section on Security
Guards and Gaming Surveillance Officers. U.S. Department of Labor.

Bureau of Labor Statistics, 2004-2005b. *Occupational Outlook Handbook*, section on Emergency
medical Technicians and paramedics. U.S. Department of Labor.

Bushby, S. T. 2001. 'Integrating Fire Alarm Systems with Building Automation and Control
Systems', *Fire Protection Engineering* 11: 5-11.

CBS News. 2003. 'Burglar Alarms Cops Wouldn't Answer', Los Angeles, April 14. Available at:
www.cbsnews.com/stories/2003/04/14/national/main549157.shtml. Accessed on: July 24,
2007.

City of Seattle, 2005. *Homeland Security Funding and Liabilities*, Office of City Auditor, Seattle
WA.

Cornes, R. and T. Sandler. 1986. *The Theory of Externalities, Public Goods and Club Goods*,
Cambridge, England: Cambridge University Press.

Criminal Justice Commission. 1997. 'The Cost of First Response Policing', *Research Paper Series*
4, Brisbane, Australia.

Cunningham, W. C., J. J. Strauchs, and C. W. Van Meter. 1990. *Private Security Trends, 1970 to
2000*, Boston, MA: Butterworth-Heinemann.

Dann, C. 2005. 'Life and Death', *Quad-City Times*, Rock Island, IL. Available at:
http://www.anemd.org/articles/rockisland.htm.

Emergency Medical Services. 2005. 'The Cost of Ambulance Services', Toronto, Ontario.
Available at: http://www.city.toronto.on.ca/ems/overview/cost.

Finley, P. J. Jr. 2001. *Residential Fire Alarm Systems: The Verification and Response Dilemma* Emmetsburg, MD: National Fire Academy Executive Fire Officer Program.

Flynn, S. 2007. *The Edge of Disaster*, New York, NY: Random House.

Goldfine, S. 2006a. 'Bratlon's Love-Hate Relationship with Security', *Security Sales and Integration* March: 39-58.

Goldfine, Scott, 2006b. 'Award Validates Vector's False Alarm Vigilance', *Security Sales and Integration* May: 32-38.

Hakim, S. and A. J. Buck. 1991. *Residential Security: The Hakim-Buck Study on Suburban Alarm Effectiveness*, Bethesda, MD: Alarm Industry Research and Education Foundation.

Hakim, S. and A. J. Buck. 1992. 'Alarm System Sales: Who Buys, Who Doesn't', *SDM Magazine*, July: 74-75.

Hakim, S. 1995. *Securing Suburban Homes: A Study on Burglar Alarm Effectiveness*, Bethesda, MD: Alarm Industry Research and Education Foundation.

Hakim, S. and E. A. Blackstone. 1996. 'Keeping a Watchful Eye on the Cost of Response to False Alarms', *Security Dealer* August: 102-108.

Hakim, S. and E. A. Blackstone. 1997. *Securing Home and Business: A Guide to the Electronic Security Industry*, Boston, MA: Butterworth-Heinemann Publishers.

Helland, E. and A. Tabarrok, 2004. 'The Fugitive: Evidence on Public Versus Private Law Enforcement From Bail Jumping', *Journal of Law and Economics* 67: 93-122.

Inspector General, 1998. 'Medical Necessity of Medicare Ambulance Services', U.S. Department of Health and Human Services. Available at: http://www.dhhs.gov/progorg/oei.

Johnson, R. 2002. 'Ambulance Wars', *Privatization: Lighthouse Privatization Shines*, Mackinac Center for Public Policy. Available at: http://www.mackinac.org/print.asp?ID=3999.

Kreps, G. A. 1998. 'Disaster as Systemic Event and Social Catalyst', in E. L. Quarantelli, ed., *What is a Disaster?*, New York, NY**:** Routledge Publishers: pp. 31-55.

Kreps, G. A. 2006. *Facing Hazards and Disasters*, Washington, D.C.: National Academies Press.

Kuchler, F. and E. Golan, 1999. 'Assigning Values to Life: Comparing Methods for Valuing Health Risks', U.S. Department of Agriculture, Economic Research Service, Agricultural Economics Report No. (AER784).

Mason, T. 2006. 'Volunteer Fire Companies Are Moving Toward Merger', *The Philadelphia Inquirer*, September 5: B3.

McChesney, F. S. 1986. 'Government Prohibitions on Volunteer Fire Fighting in 19th-Century America: A Property Rights Perspective', *Journal of Legal Studies* 15: 69-92.

MDA Ambulances. 2005.'MDA Ambulances: Israel's Symbol of Life and Hope'. Available at: http://www.magendavidadom.org/ambulances.asp.

Mehay, S. L. and R. A. Gonzalez. 1992. 'Direct and Indirect Benefits of Intergovernmental Contracting for Police Services', in G. W. Bowman, ed., *Privatizing the United States Justice System*, Jefferson, NC: McFarland and Co. Publishers: pp. 67-81.

Menino, T. M. 2008. 'A Volunteer Medical Corp: The Boston Experience', in S. Hakim and E. Blackstone, eds., *Improving Homeland Security*, Lanham, MD: Rowman and Littlefield (forthcoming).

National Fire Protection Association (NFPA), 2005. *Fire Departments Calls*, Quincy, MA.

National Volunteer Fire Council. 2005. 'Fact Sheet', Washington, D.C. Available at: http://www.nvfc.org.

Newman, O. 1996. *Creating Defensible Space*, US Department of Housing and Urban Development, Office of Policy Development and Research. Contract No. DU100C000005967.

Olson, M. 1965. *A Logic of Collective Action*, Cambridge, MA: Harvard University Press.

Ontario Ministry of Health and Long-Term Care. 2005. 'Emergency Health Services Branch

Statistics'. Available at:

http://www.health.gov.on.ca/english/public/program/ehs/ehs_dt.html.

Parks, R., S. Mastrofski, C. Dejong and M. K. Gray. 1999. 'How Officers Spend their Time with the

Community', *Justice Quarterly* 16: 483-517.

Pastor, J. F. 2003. *The Privatization of Police in America*, Jefferson, NC: McFarland Publishers.

Peltzman, S. 1975. 'The Effect of Automobile Safety Regulation', *Journal of Political Economy* 83:

677-725.

Peltzman, S. 1976. 'Towards a More General Theory of Regulation', *Journal of Law and*

Economics 19: 211-240.

Perry, R. W. and M. K. Lindell. 2003. 'Preparedness for Emergency Response: Guidelines for the

Emergency Planning Process', *Disasters* 27: 336-350.

Philadelphia Fire Department. 2006. Statistics for 2005 on the cost of false alarms for EMS and Fire

Response, calculated by the Philadelphia Fire Department.

Pomfret, J. 2006. 'Police Finding it Hard to Fill Vacancies', *Washington Post* March 26. Available

at: www.msnbc.msn.com/id/1029579/page2/print/./displaced mode/1098/.

Prendergast, J. 2003. 'You Call, We Haul', *Cincinnati Inquirer*, May 11. Available at:

www.enquirer.com/editions/2003/05/doc_cityrescue.html.

Quarantelli, E. L. 1986. 'Disaster Crisis Management', Preliminary Paper # 113 delivered at the

International Conference on Industrial Crisis Management, New York City, September 6.

Raletz, A. E. 2005. 'False Alarms Plague Police, Fire Departments', *Saint Joseph News-Press*,

January 29.

Reason Foundation. 2006. *Emergency Medical Services*. Available at:

    http://www.privatization.org/database/policyissues/ems_local.html

Romeo Observer. 2005. 'Pulled Fire Alarm Results in Charge', June 8. Available at:

    http://www.romeoobserver.com/story.asp?storyid=4663.

Rudman, W. B. 2003. *Emergency Responders: Drastically Under Funded, Dangerously*

    Unprepared, New York, NY: Council on Foreign Relations.

Salt Lake City. 2005. Personal Communication with City Officials. June 3.

Salt Lake City Fire Department. 2006. 'Fire Alarm Ordinance Summary'.

Salt Lake City Police Department. 2006. 'Verified Response: The False Alarm Solution'.

Sampson, R. 2001. *False Burglar Alarms, Problem Oriented Guides for Police*, No. 5, U.S.

    Department of Justice; Office of Community Oriented Policing Services.

Samuelson, P. 1954. 'The Pure Theory of Public Expenditures', *Review of Economics and Statistics*

    36: 387-389.

Scherer, F. M. and D. Ross. 1990. *Industrial Market Structure and Economic Performance*, 3rd

    edition, Boston, MA: Houghton Mifflin Company.

Schwartz, A. 2004. 'Reason for Alarm: False Alarms Take Cops from Real Crimes', *The*

    *Milwaukee Buzz***,** August 24. Available at:

    www.omiwaukee.com/buzz/articles/.wispo/10824.

Scott, M. S. and H. Goldstein. 2005. 'Shifting and Sharing Responsibility for Public Safety

    Problems', *Problem Oriented Guides for Police (POPS)*, U.S. Department of Justice, Office

    of Community Oriented Policing Services, Response Guide Series #3.

Spivak, W. 2004. 'False Alarms are No Joke', National Press Corps, U.S. Coast Guard Auxiliary.

Towns, S. 2007. 'The Sacrifice at Home'. *Government Technology* August.

Toy, V. S. 1995. 'Six Injured when Fire Truck Collides with Car', *NY Times*, May 29, Metro: 25.

US Conference of Mayors (USCM). 2004. 'Second Mayors' Report to the Nation: Tracking HLS

   Funds sent to the 50 State Governments', Washington, DC, USCM.

U.S. Department of Homeland Security (US DHS). 2003. *Homeland Security Exercise and*

   Evaluation Program, 1. Office for Domestic Preparedness. Available at:

   http://www.ojp.us.doj.gov/odp. Report # NCJ199536.

U.S. Department of Transportation, National Highway Transportation Administration. 2004.

   'Traffic Safety Facts 2004', Washington, D.C., 2004.

U.S. Government, General Accounting Office. 1998. 'Privatization: Questions State and Local

   Decisionmakers Used When Considering Privatization Options', Washington, D.C.

   GAO/GGD-98-87.

Table 1. Savings from Elimination of False Responses and some Non-Public Goods Activities

First Responders Police	Annual Savings	Number of First Responders
Elimination of False Alarm Response	$1.8 Billion	35,000
Elimination of other Non-Public Goods Activities	$1.0 Billion	20,200
Fire		
Elimination of False Alarm Response	$0.93 Billion to $2.443 Billion	18,600 to 48,900
Ambulance		
Elimination of False Alarm Response	$0.916 Billion	18,300