eCall - a socioeconomic benefit cost analysis

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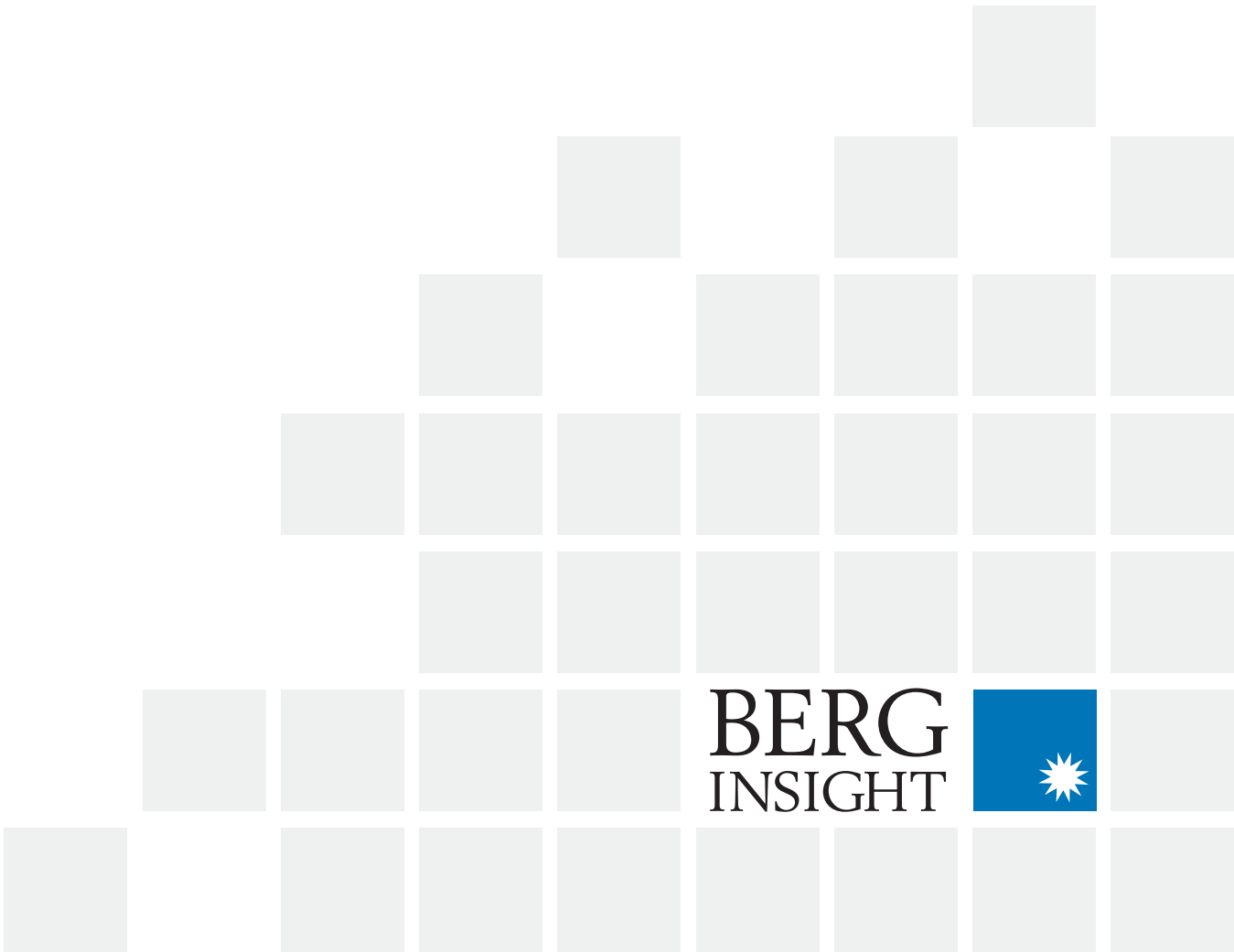

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Industry research whitepaper

eCall – a socioeconomic benefit cost analysis

The European Commission has proposed that the EU member states should implement an automatic emergency call system supported by public PSAPs in all new cars in the coming decade. The eCall system is intended to automatically initiate an emergency call to the common European emergency number 112 from the vehicle and transmit satellite positioning data to the operator in case of a road accident. By reducing the reaction time for the emergency services, the system is expected to save thousands of lives annually when fully implemented. When realised the system will generate shipments of 15–20 million telematics units on all new motor vehicles sold in the EU and Western Europe and ultimately cover more than 200 million cars.

Socioeconomic benefit cost analysis

Expected socioeconomic benefits are the primary motivation behind the eCall initiative. Yet many stakeholders, including key EU member states, remain unconvinced that the system will generate a net benefit When evaluating the socioeconomic benefits of eCall, one must first make assumptions about the average reduction in reaction time that can be derived from an automatic alarm system. Secondly the severity of injuries has to be analysed in order to assess impact of reduced reaction time. Thirdly the value of life saved and severe injury prevented must be translated into monetary units. Neither of these tasks are easily accomplished and the third one is almost impossible. In the final cost benefit analysis the monetary value of human life and well being is weighed against the higher production cost of vehicles plus the cost for upgrading PSAPs. A scenario based on optimistic assumptions can easily indicate very large benefits. Even with a quite modest efficiency, eCall can however be expected to generate a socioeconomic net benefit as will be demonstrated in this analysis.

Figure 1: Number of road accidents and fatalities and severe injuries (EU25 2004)

Country	Fatalities	Per 1,000 people	Severe injuries	Per 1,000 people
Austria	956	0.12	8,043	0.98
Belgium	1,486	0.14	8,949	0.87
Cyprus	98	0.28	578	0.59
Czech Republic	1,431	0.14	5,520	0.54
Denmark	431	0.08	3,946	0.73
Estonia	223	0.16	470	0.34
Finland	415	0.08	8,156	1.57
France	7,655	0.13	24,091	0.40
Germany	6,842	0.08	88,382	1.07
Greece	1,880	0.18	3,238	0.30
Hungary	1,429	0.14	3,959	0.40
Ireland	412	0.10	1,417	0.33
Italy	6,314	0.11	41,138	0.71
Latvia	518	0.23	1,033	0.45
Lithuania	697	0.19	1,217	0.34
Luxembourg	60	0.13	440	0.98
Malta	16	0.04	212	0.53
Netherlands	1,090	0.07	12,388	0.76
Poland	5,827	0.15	9,276	0.24
Portugal	1,655	0.16	4,690	0.46
Slovakia	610	0.11	1,777	0.33
Slovenia	269	0.14	2,361	1.24
Spain	5,516	0.14	27,272	0.68
Sweden	583	0.06	4,058	0.45
United Kingdom	3,431	0.06	37,514	0.62
Total	49,844	0.11	300,126	0.66

Source: CARE 2004; IRTAD 2004

Benefit analysis

Accident cost savings is the main benefit of eCall, achieved through a higher efficiency of the rescue chain. A shorter rescue time may also reduce the congestion time as the accident scene can be cleared more quickly. When medical care for critically injured people is available at an earlier time after the accident, the fatality rate can be significantly reduced. This is known as the Golden Hour Principle of accident medicine, first established from US military wartime experience. During the first hour after a severe injury has been inflicted, the chance of survival of people with heart or respiratory failure decreases from 26 percent to 5 percent. Therefore the reaction time of the emergency services is of the utmost importance.

Several separate European studies have tried to establish the impact of automatic emergency call systems based on the Golden Hour Principle. The German study STORM (Stuttgart Transport Operation by Regional Management) was used by the EU financed E-MERGE project, completed in 2004. STORM showed nearly 50 percent rescue time improvement in rural areas, with a reduction from 21 minutes to 12 minutes. This was significant as accidents in rural areas are overrepresented among fatalities. In urban areas the average time decreased from 13 minutes down to 8 minutes. Similar results have also been reported from France and the US. E-MERGE concluded that these reductions in rescue time would lead to 5–15 percent fewer fatalities and 10–15 percent reduction of severe injuries.

Figure 2: European studies on the estimated impact of eCall

Study	Reduction fatalities	Reduction severe injuries
E-MERGE/STORM, Germany	5–15 %	10–15 %
Ministry of Transport, Finland	4–8 %	N/A
Swedish Road Administration	2–4 %	3–4 %

Source: Berg Insight

More recently, there have been national studies on the impact of eCall in Finland and Sweden. Since these countries have road fatality rates of 30 percent and 40 percent below the EU average respectively, they are believed to have the lowest potential for eCall. The

Swedish Road Administration compared the international experience regarding reductions in rescue time with a previous study on ambulance helicopters from the 1980s. This study had found that the survival rate increased from 18 percent to 23 percent when the rescue time was reduced from 20 minutes to 10 minutes. When applied to the data from the STORM study, the impact on fatalities was found to be 5 percent in rural areas and 2 percent in urban areas. Altogether, the Swedish Road Administration concluded that a fully implemented eCall system would reduce road fatalities by 2–4 percent and severe injuries by 3–4 percent. The Ministry of Transport and Communication in Finland published a study in January 2006, indicating a potential to reduce fatalities by 4–8 percent. No assessment was made regarding severe injuries, as sufficient statistical data was not available. The Finnish study evaluated all road accidents involving motor vehicle occupants causing fatalities during the period 2001–2003 when mobile phone penetration in Finland had reached 100 percent. Among 900 accidents studied, it was estimated that eCall could very probably have prevented the fatality in 43 cases.

Figure 3: eCall impact analysis

Time from introduction	Year 1	Year 2	Year 3	Year 4	Year 5	Year 15
eCall penetration rate	7 %	14 %	21 %	28 %	35 %	100 %
Impact on fatalities						
Fatalities (-1 %)	-33	-66	-99	-132	-164	-469
Benefit, € million/%	52	103	154	204	255	727
Impact on severe injuries						
Severe injuries (-1 %)	-203	-404	-605	-805	-1,005	-2,863
Benefit, € million/%	83	153	201	268	335	953

Source: Berg Insight

A socioeconomic benefit analysis of eCall requires that monetary values are attached to the change of a fatality to severe injury and a change of a severe injury into a slight injury. Based on cost units used in Sweden and Finland, the average economic gain from a fatality converted into an injury is € 1,552,375. According to the same standards, the average economic gain from a severe injury converted into a slight injury is € 333,012. These monetary values are intended for economic analysis only, at an aggregate level and do not represent an attempt to put a price tag on human life. About 10–25 percent of the benefits are direct financial gains, primarily in the public sector and for insurance companies. The greater part is related to loss of well being and related productivity losses.

The plan for eCall is that the system will be introduced gradually as a standard option on new type approved vehicles. As a consequence, the penetration will grow steadily by 7 percentage points annually over a period of 15 years. Only accidents involving vehicles equipped with eCall will receive the positive effect of the system. Figure 3 above shows an impact analysis for eCall at different penetration rates. Based on statistics for EU25 from 2004, every 1 percent reduction in fatalities would save 33 lives annually when the penetration rate is 7 percent. Once the penetration rate has reached 100 percent, 469 deaths could be avoided annually for every 1 percent reduction in fatality rates. Translated into the monetary units presented above, the socioeconomic benefit would grow from € 52 million annually for every 1 percent reduction in fatality rates with a penetration of 7 percent up to € 510 million annually with 100 percent penetration for eCall. Every 1 percent reduction in severe injuries would result in 203 fewer incidences at a penetration rate of 7 percent. With 100 percent penetration the reduction would amount to 2,863 less severe injuries. Expressed in monetary terms, every 1 percent reduction of severe injuries would generate a socioeconomic benefit of € 68 million annually with a penetration rate of 7 percent and reach € 953 million with 100 percent penetration.

Cost analysis

The costs for implementing eCall are more easily defined than the benefits, even though there are still some uncertainties regarding the technical specifications as discussed in the following section. Car manufacturers will carry the greater part of the cost for implementing eCall. According to estimates by ACEA, the direct cost for the IVS plus integration will be €100–150 per vehicle. Suppliers have indicated that embedded solutions should be expected

to cost less than € 100, even in relatively small volumes by 2009. There are however strong reasons to believe that component prices will decline significantly once eCall is put into mass-production. After five years the average cost is expected to have declined by 50 percent to about € 50. The final specifications for eCall are expected to require a SIM that will be provided by mobile operators. The cost for managing a SIM that does not generate any network traffic is estimated to at most € 10 per year in very high volumes. That is in line with the projected costs for other high volume wireless M2M applications such as remote meter reading. Assuming that the automotive industry will pass on all costs for eCall to the consumers, the car buyers in Europe will collectively carry an annualised cost growing from €165 million in the first year of implementation to € 1,500 million when eCall is fully deployed. The public sector will be responsible for upgrading PSAPs with capabilities to receive and process location information. According to the SEiSS report, published by the eSafety Forum in February 2005, the average cost for upgrading a PSAP range from € 30,000 to € 50,000 including training. With approximately 5,000 PSAPs in the EU, the upgrade cost would be in the span of € 150–250 million. Additionally, training of PSAP staff was estimated to cost about € 27–45 million. With a depreciation period of 15 years, the annual cost for eCall for the public sector in the EU Member States will be about € 15 million.

Conclusions

In the final socioeconomic analysis of eCall, the benefit cost ratio is estimated based on different scenarios. If the benefit cost ratio exceeds 1.0, the economic benefits are larger than the economic cost. Thus every euro spent on the system will generate a return greater than one euro. The socioeconomic profitability of eCall hinges on the actual impact on fatalities and severe injuries. Based on the assumptions presented above, the socioeconomic breakeven point for eCall is at 3 percent fewer fatalities and severe injuries annually. This is within the lowest span of the impact suggested by available studies. With regards to available data, an impact of more than 6 percent on causalities is not deemed likely. An overall impact of 3–6 percent on causalities implies a benefit cost ratio of 1.0–2.1 in the first years, as shown in figure 4.5 below. Over time the ratio will increase to 1.3–2.6 once 100 percent penetration is achieved. In the low impact scenario, eCall would save 1,484 lives during the initial five years and prevent 9,070 severe injuries. Nearly 11,000 people would have their health preserved, with direct effects on the well-being of hundreds of thousands of European citizens.

Figure 4: eCall socioeconomic benefit analysis

Time from introduction	Year 1	Year 2	Year 3	Year 4	Year 5	Year 15
eCall penetration rate	7 %	14 %	21 %	28 %	35 %	100 %
High impact scenario						
Fatalities (-6 %)	-201	-397	-594	-790	-987	-2,812
Benefit, € million	311	616	922	1,227	1,579	4,499
Severe injuries (-6 %)	-1,226	-2,427	-3,628	-4,829	-6,031	-17,184
Benefit, € million	408	808	1,208	1,608	2,008	5,722
Total benefit	720	1,424	2,130	2,835	3,540	10,087
Annualised cost, € million	-344	-652	-933	-1,199	-1,450	-3,811
Net benefit	375	773	1,196	1,635	2,090	10,087
Benefit cost ratio	2.1	2.2	2.3	2.4	2.4	2.6
Low impact scenario						
Fatalities (-3 %)	-100	-199	-297	-395	-493	-1,406
Benefit, € million	156	308	461	613	765	2,182
Severe injuries (-3 %)	-613	-1,213	-1,814	-2,415	-3015	-8,591
Benefit, € million	204	404	604	804	1,004	2,861
Total benefit	360	712	1065	1,417	1,770	5,043
Annualised cost, € million	-344	-652	-933	-1,199	-1,450	-3,811
Net benefit	14	56	126	211	311	1,205
Benefit cost ratio	1.0	1.1	1.1	1.2	1.2	1.3

Source: Berg Insight

The economic net benefit from this is calculated to € 746 million. In the high impact scenario, the accumulated effect over the initial five years would be 2,968 lives saved and 18,141 severe injuries prevented – totally more than 21,000 people. This would translate into an economic net benefit of € 6,070 million. A balanced analysis thus gives at hand that eCall is

beneficial from a socioeconomic standpoint in its own right and can be highly justified as a political project. From a strictly humane perspective any debate over the monetary value of eCall may appear superfluous. eCall clearly presents an opportunity to save thousands of lives and prevent tens of thousands of severe injuries over the coming decade. The ongoing debate is concerning whether or not it would be worthwhile to invest in new technology in order to do so. If so, an even more critical question arises – who should be paying?

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