eCall data analysis

Quantitative analysis, December 2023

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INTRODUCTION

Pan-European eCall (hereinafter: eCall[1]) is an emergency response system that has been mandatory in newly type-approved passenger vehicles since 2018. The system is primarily intended to initiate emergency response quickly in the event of incidents. To this end, an eCall system will automatically establish a connection with 112 if there are signals that the vehicle is involved in an incident of some magnitude. In addition, the eCall system offers occupants the opportunity to manually contact the 112 operator. Unlike a normal 112 call, an eCall also digitally transfers information about the vehicle involved and its location.

A need has arisen from various sides for a further, quantitative analysis of the eCalls that arrive. Such as the division between automatic and manual notifications, the extent to which eCall notifications actually lead to the deployment of emergency assistance, etc. A design for phased effect measurement has been described for this purpose. The present document is the result of a quantitative analysis of the eCalls received in December 2023 in The Netherlands. This analysis is the implementation of the first phase of the aforementioned design.

This document contains analyses of the stored data and, per topic, some conclusions regarding the content. This is the first time that such an analysis has taken place, so some recommendations are also included. Repeating a quantitative analysis like this can provide valuable information for adjusting and adjusting the handling and follow-up of eCalls . It also provides insight into the way in which the standards are complied with and to what extent the standards need to be tightened up to better align with practice within 112. A multi-layered analysis, as described in the above-mentioned structure, in which information is also collected from the regional control rooms. and also to the road manager, can contribute to an even clearer picture and could also provide an idea of the usefulness of eCall.

For the sake of completeness: the analysis in this document only concerns pan-European eCall emergency calls.

Note on this English version: some elements, specific for the Dutch situation, have been omitted from this version like: name of fields in the PSAP database, very specific recommendations for the Dutch system, etc.
.

[1] Within the context 'eCall', a distinction is made between the pan-European eCall and the Third Party System (TPS) eCall. The last variant concerns any system in which (from a vehicle) in an emergency situation, contact is first made with a private emergency centre. After assessment by the operator, the call or report can be forwarded to the regional emergency services in a standardized manner.

DATA SOURCE AND PROVISION

eCall system within 112

eCall calls are routed from the mobile networks to the national 112 exchange. Two *endpoints are* available for this purpose: one for automatically activated eCalls , the other for manual ones. In both situations, the call is first routed via a *modem*, after which the digital information is transferred. This information is contained in the *Minimum Set of Data* (MSD) and includes, among other things, the location from which the call was initiated, identification of the vehicle, number of occupants, etc. This information is stored in the central call database of the 112 exchange. .

After the transfer of the MSD, the call is transferred to a 112 operator. They can then communicate directly with the occupants. At the same time, additional vehicle information is retrieved from EU-CARIS in the background. This is done based on the vehicle identification number (VIN), which is part of the MSD. This additional information is also stored in the database. This also applies to additional enrichment, such as the location based on cell tower data, etc.

The operator will or will not forward the call to an emergency service based on the information received and the call with the occupants, the call and all digital information. This action is also included in the database.

Data extraction

Basic information

The digital data about eCall (and other 112) calls is available in the database for several months. For the purpose of this analysis the following data elements were used:

Date/Tme[2]
Timestamps set when the record was created and when the call was answered
Timestamp of the incident (source: MSD)
Identification of "caller"
The (encrypted[3]) phone number (CLI) and device identification (eCall) from where the eCall originated
The Vehicle Identification Number (VIN) as provided via the MSD
eCall specific
The type of eCall (automatic/manual/test) retrieved from MSD and the type based on the call routing
Vehicle information
Brand and model of the car (source: EUCARIS based on VIN)
Type of the vehicle (source: MSD)
Propulsion of the vehicle (source: MSD)
Number of people in the vehicle at the time of incident (source: MSD)
Location information
Location of the vehicle as reported by network (triangulation)
Location and previous locations as embedded in MSD (incl. reliability indicator and compass direction)
Dispatch 112
Information about if the call was transferred to a regional emergency centre of labelled as abuse

[2] It is unclear if the exported timestamps are in the local time zone or UTC.

[3] The phone number and IMEI are irreversibly encrypted such that it can still be used to determine the unicity of the caller. The first digits are kept unencrypted, to allow for analysis of the origin of the sim card..

Data was extracted from the database for those calls marked as eCall that took place between December 1, 2023 at 00:00:00 and January 1, 2024 at 00:00:00. This extraction contains **2847** eCall calls.

Test calls

None of the calls in the database are indicated in the MSD as a test call. For **4 calls** this is, however, indicated in a digital note. **In three of those the MSD content is identical**, and the same content was recorded on seven other calls. Although those calls are not labelled, they are still considered tests.
These 11 calls will be ignored further below , so **2836** calls remain.

Availability information from MSD and EUCARIS

Call data, information from the MSD and enrichment data are used for the analysis. To prevent the analysis from being disturbed by missing data, a (limited) check is carried out.

No or incomplete eCall data (MSD)

All calls are provided with MSD values, which means that no calls are received where the transfer of the MSD fails, or that are unintentionally routed via the eCall input, but do not contain a data payload. Based on experiences during so-called test fests and also reports from foreign 112 exchanges, this is an unexpectedly favourable result.

In **686** calls, an MSD appears to be present, but (mandatory) MSD fields are missing, and the VIN is filled with a clearly incorrect[4] value (*WM0VDS0000V0SP000*). It is unclear whether these MSD values are received this way or are entered in the 112 chain. Both are undesirable, but the first would also mean non-conformity with the standards. The calls come from three different SIM cards, two with a Dutch M2M number - each good for more than 300 calls and a Danish M2M number. As far as can be determined, these calls are received as 'manual eCall'.

These calls will be ignored further below , so **2150** calls remain.

No or incorrect VIN and/or no vehicle information

Unlike American VINs , VINs intended for Europe usually do not have a check digit (a requirement to do so since 2022), making it not possible to check VINs syntactically. For this analysis, the rule is that the VIN is only considered valid if information about it could be requested via EUCARIS[5]. This is the case with **2007** calls, with 143 calls no EUCARIS information was included. These calls are included in the analysis, but where brand or type information is used subsequently, they are marked as 'unknown'.

[4] A VIN consists of a World Manufacturer Identification (WMI), a Vehicle Description Section (VDS) and a Vehicle Identification Section (VIS). The VIN in these calls can clearly be recognized as incorrect, because it consists of a combination of these abbreviations (**WM** 0 **VDS** 0000 **V** 0 **S** P000). A further analysis of the other VINs will follow later in this report.

[5] Since for each call it is registered that a response was received from EUCARIS, system failure is in any case not a cause. An error code has not been stored, so there is no known reason why no result was found with the VIN.

EUCARIS consistency

The information retrieved via EUCARIS is not always consistent[6]. Some examples:

- brand XXX also appears as X.X.X.;
- names of models are sometimes part of the brand (the value of the brand field contains, for example, “XXX X9999E XX” instead of “XXX”);
- brands and names of models are not spelled consistently

The brand name is also sometimes repeated in the model name. For the analysis, all spellings have been aligned and this has no further consequences. It is something to be aware of if the information is (for example) used to electronically look up further data - think of so-called clip cards at the fire brigade.

Data control

Several data elements can be compared with each other or with an external source.

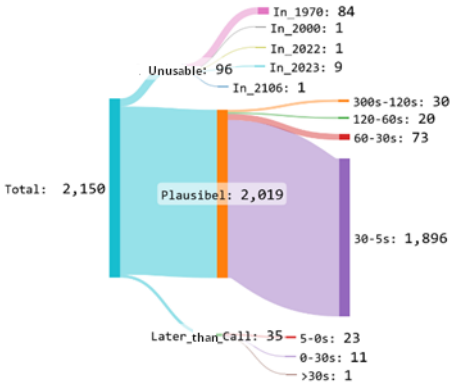
No or incorrect CLI

All 2150 calls are equipped with a CLI (= number from which the call is started). Except for **6 calls, the** CLIs fit plausibly into the international numbering scheme[7]. Of these six calls, 4 carry a landline number from the United States, one has a landline number from Denmark and one has a CLI that starts with +31112 - which does not fit the Dutch numbering scheme. It is striking that there is not a single call without a CLI or with an IMEI [8]as a CLI. This is also an unexpectedly favourable result, based on experiences elsewhere.

eCall time in MSD

The database records the time at which the call was received by the 112 exchange. The MSD also contains a time, which is the moment the eCall started.

The time in the MSD of **96** calls was not usable. For 84 calls, the MSD did not contain a time (value 0), which is shown in the database as '01-01-1970 01:00:00'. For one call, the time is '07-02-2106 07:28:15', which represents the maximum possible value (in the MSD).
The (unusable) eCall time of the other 11 calls was more than 5 minutes before the moment the call arrived at the 112 exchange.



An unsuitable time can have an effect on the assistance provided. In most cases, it appears to be an 'old' incident. Less problematic, but it is striking, that in **35** calls the time of the incident, as recorded in the MSD, was after (or very shortly before) the time of the call. Since there

[6] EUCARIS connects the registration authorities in the member states, provides a uniform method of exchange, but does not contain any data itself. The inconsistencies can be traced back to the way (and quality) in which the data is stored in national registers and how the population of the EUCARIS messages has been implemented by the national registers.

[7] A further breakdown of the prefixes will follow later in this report.

[8] An IMEI number consists of 16 digits, the first two of which must correspond to permitted so-called *RBIs* , and the latter must be equal to the check digit. Where a CLI could be an IMEI, further investigation has been conducted

is a connection established, it is expected that in these cases the clock in the vehicle was not synchronized. The maximum difference was 34 seconds.

The remaining **2019** calls have a plausible eCall time in the MSD. In most cases, the time was within 30s of the moment the call came in.

Location data

The location at which an eCall is initiated is part of the MSD. As with all 112 calls, a location derived from the cell tower location is, in principle, also available for eCall calls.

In **5** calls, both the MSD locations [9]and the cell tower location are missing. For **40** calls, the MSD locations are missing, but a cell tower location is available. For **33** calls, the MSD location is (almost) equal to (0.0) and therefore invalid - in all these cases a cell tower location is available. There is no known cell tower location for **242** calls, but there is a (valid) MSD location - two of these calls, according to the MSD, were set up from England.

In principle, the analysis uses the MSD location (applies to 2072 calls), if this is not available (or invalid) the cell tower location is used (73 calls). The (5) situations in which both locations are unknown are not considered in the location analysis.

[9] It is assumed that in this case the MSD for (one of the two) coordinates contained the value for 'unknown'.

Conclusions and recommendations

Of the 2847 calls for which data were included in the original dataset, **697** are dropped. The reason is either that there is a test call marked as such (11 calls), or that complete data has not been received (686 calls from 3 vehicles).
For the month of December 2023, **2150** calls will therefore be marked as actual eCalls and included in the effect measurement. The actual number may be lower, but there are no features to filter it.

It seems almost impossible that the transfer of the MSD was successful during all eCall conversations. Further investigation is needed to determine whether the correct query was made and whether components in the receiving chain might be inserting dummy values. This should happen as little as possible – and preferably not at all – if not for the emergency process itself, then for effective research.

The original dataset contains several calls marked as test calls – without the MSD being marked as such. At the same time, it is clear that these carry a static MSD – as evidenced by the date in 2018. The recommendation here is that, in the case of 'own' tests, the test flag in the MSD should always be activated.

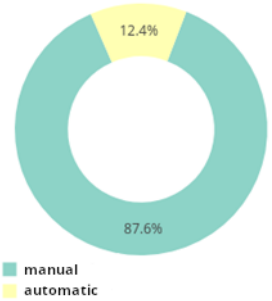
The dataset shows that sometimes the value (0,0 – rounded) appears as the location in an MSD. Although this is a valid coordinate, it is immediately clear that this is an invalid value. To avoid affecting the emergency response process with an incorrect location, it is recommended not to use this location and treat it as 'unknown.'

Some data seem to be lost in the reception process or, at the very least, not stored. This includes, for example, the raw MSD (hexadecimal string), any error reporting from the EUCARIS query, etc. For an investigation like this, and also to audit and improve the reception process, it is recommended to record this information.

GENERAL INFORMATION

In this effect measurement, the data from a total of 2,150 calls are analysed. Before delving deeper into specific components such as emergency assistance needs and location information, this chapter contains some general characteristics.

Automatic and Manual activation



Vehicles equipped with eCall and detecting an incident will automatically initiate an eCall. Manual activation is preceded by an action by an occupant. Of the 2150 eCalls in this analysis, **266 were** initiated automatically, the rest (**1884**) manually.

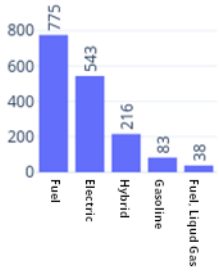
Vehicle information

The eCalls in the collection under consideration come from **1985** different vehicles: **1660** passenger cars (category 'M1'), **323** light commercial vehicles (category 'N1') and **2** heavy ones (category 'N2').

Brands

The vehicles are from **40** different brands. Some brands are overrepresented, but the reason for this is unclear. In any case, these brands are well represented in the active vehicle fleet. More models might be equipped with eCall from the factory, for example, in models for which the requirement does not apply. The brands of the vehicles from which eCalls have been received are included as an attachment.

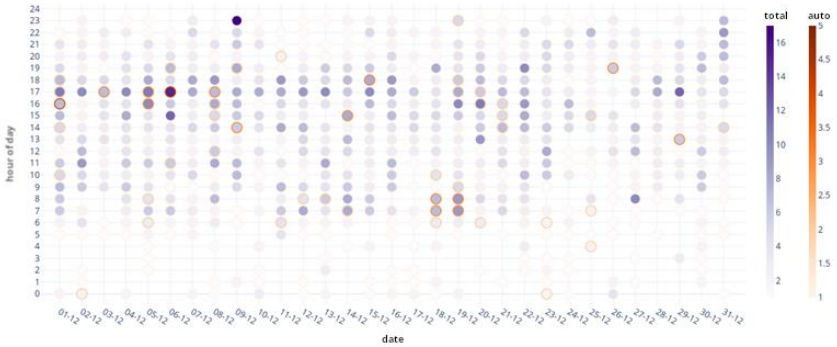
Fuel



The vehicles in category 'N' almost all use diesel, 15 vehicles run electrically. Three vehicles run on petrol, sometimes in combination with CNG. The distribution is different for passenger cars:

Date and time

The eCall calls are received fairly evenly throughout the month, with a dip around Christmas. Viewed on a per-day basis, the focus is at the end of the afternoon.



The graph shows the numbers per clock hour. Automatically activated eCalls are extra highlighted.

SIM provider

Each eCall device is equipped with a SIM card. Which provider has provided this SIM card can be determined from the telephone number linked to the call. This telephone number is also important if there is a need to call the vehicle back.

prefix	total	automatically	manually	provider/origin
+88239	1045	137	908	International network, Vodafone Malta
+88313	540	53	487	International network, France Telecom
+31970	285	23	262	Netherlands, M2M
+33700	215	47	168	France, mobile
+46719	30	0	30	Sweden, M2M
+43676	14	1	13	Austria , T-Mobile
+88247	7	3	4	International network, Transatel
+49151	6		6	Germany, T-Mobile
+31637	2		2	Netherlands, mobile
+14172	1		1	QUESTIONABLE - USA, Missouri
+16014	1	1	0	QUESTIONABLE - USA, Mississippi
+18654	1		1	QUESTIONABLE - USA, Tennessee
+19104	1		1	QUESTIONABLE - USA, North Carolina
+45474	1	1	0	QUESTIONABLE - Denmark, ISDN
+31112	1		1	INCORRECT

The origin of the questionable numbers is unclear, the so-called IMSI may have been passed on here. The most used providers are used by more brands, some brands use more than one provider:

- the eCalls of **16** brands (**927** calls in total) exclusively carry prefix +88239;
- the eCalls of **6** brands (**382** calls in total) exclusively carry prefix +88313;
- the eCalls of **2** brands (**228** calls in total) exclusively carry prefix +31970;

- the eCalls of **7** brands carry 2 prefixes:
  - for **3** brands, the prefixes are +33700 (**17** eCalls) and +88313 (**8**);
  - for **1** brand, the prefixes are +31970 (**49** eCalls) and +46719 (**14**);
  - for **1** brand, the prefixes are +88313 (**10** eCalls) and +46719 (**7**);
  - no significant conclusion is possible for **2** brands, due to insufficient calls;

- the eCalls of **2** brands carry 3 prefixes:
  - one uses prefixes +88313 (**13** eCalls), +46719 (**6**) and +88239 (**1**)
  - the other uses prefixes +88313 (**84** eCalls), +88239 (**17**) and +33700 (**3**)

Some brands are left out of this list, due to insufficient calls.

Location of the notification

Using the different locations, an image can be obtained of the geographical distribution of the eCalls .

Distribution by region

The reports are spread across the country, with a clear over-representation of the “Randstad”. The northern provinces are clearly less visible as a source of eCalls . Most reports come from **Amsterdam** (+/-120) and **Rotterdam** (+/- 100). The Hague and Utrecht follow at a distance, with approximately 50 reports each.

Several calls contain a (valid) MSD incident location abroad, usually in the border region with Belgium or Germany. **Four** exceptions to this are the calls for which the MSD incident location is in. England (2x), Mexico and Turkey[10] respectively.

Distribution by roads and road authorities

Although the location data is useful for providing visual insight into the incident location on maps, matching locations to roads in bulk is less reliable. With this lower reliability in mind, approximately one fifth of the reports (400-450) come from a highway. About 300–350 reports come from a N-road, the other reports come from underlying (often municipal) roads.

On the highways, the **A2, A4** and **A28 score** high, with more than 15 eCalls each. On the N roads, it is mainly the **N206** and **N201,** both with more than 5 reports.

[10] This is technically not possible – an eCall is a 112 call that is always handled in the region. The cell tower locations of the eCalls "from" Mexico and Turkey locate the vehicles respectively. in Zeeland and Leidschendam. There are no cell tower locations available for calls to an MSD location in England.

EMERGENCY AID NEED

The primary purpose of eCall is to make emergency assistance more accessible in the event of incidents. Vehicles equipped with eCall detecting an incident will automatically initiate an eCall. With manual activation, the reason may be something that involves the vehicle or an occupant. It may also be a so-called 'samaritan call' - where the emergency services are alerted by someone because something is wrong with someone else (not related to the vehicle). In addition, the eCall may be activated manually without proper reason - for example because the wrong button is used.

From the available data, it cannot be directly determined whether there was a need for emergency assistance. However, it is known whether the 112 operator forwarded the call to a regional emergency centre[11]. The assumption is that in those cases, there was a need for emergency assistance.

Occasionally, the operator cannot contact the occupants, which is called a 'silent eCall'. There can be several reasons why an eCall is 'silent', usually an operator will assume that the occupants are unable to communicate and forward the call. There is no information available on whether communication with the occupants took place before the call was forwarded or if it was a 'silent eCall'.

Automatic activation

Of the **266** automatically activated calls, **207** (**77.8%**) are transferred to a regional emergency centre. Except for 2, the calls that were not forwarded were labelled with 'Not 1-1-2' as the reason; a further breakdown (for example: an incident, but not serious) cannot be made. Not a single diverted call has been classified as abuse.

Repeated activation

Given the nature of an automatic eCall, it is expected that a vehicle will not initiate more than one automatic eCall in a consideration period of one month. It is therefore striking that two vehicles generate more than one automatic eCall:

- one vehicle generates an automatic eCall on two different days, which in both cases is not forwarded and is labelled 'No 1-1-2';
- one vehicle generates three calls in a period of 21 minutes, all three of which are forwarded.

	# veh	forwarded	not forwarded		
			Not 1-1-2	Abuse	(no reason)
1x eCall	261	**204**	**55**		**2**
2x	1	**0**	2 of 2: 1 vtg **2**	**0**	**0**
3x	1	3 of 3: 1 vtg **3**	**0**	**0**	**0**

This number is quite limited and does not pose a real burden on the emergency response process.

[11]Although the dataset does contain a field in which it is registered to which regional control room a call is forwarded, this field appears to be empty in most cases (more than 80%).

Callbacks

It cannot be determined from the data whether the 112 operator or regional control room made use of the option to call back. It is clear that in **4** cases an eCall was manually activated within 1 hour after an automatic activation, which in **1** case led to transfer to a regional control room.

Manual activation

Of the **1884** manually activated calls, **252** (**13.4%**) are transferred to a regional control room[11]. The assumption is that in those cases there was a need for emergency assistance. Here too, most calls not forwarded are labelled with 'Not 1-1-2' as the reason. See also below.

Repeated activation

While with automatic activation - in principle - it is not expected to be activated more than once - if only because the vehicle becomes unusable in the event of a somewhat larger incident, this is different with manual activation. Not only can a “caller” see the need for activation more often, there is also a chance of repeated misuse. The data regarding repeated activation have therefore been analysed in more detail.

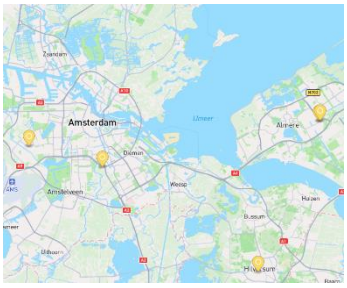
	# veh	forwarded		not forwarded					
				Not 1-1-2		Abuse		(no reason)	
1x eCall	1660		**203**		**1448**		**2**		**7**
2x	51	1 of 2: 5 veh 2 of 2:2 . . .	**9**	1 of 2: 7 veh 2 of 2: 42 veh	**91**	1 of 2: 2 veh	**2**		
3x	6	1 of 3: 3 veh	**3**	1 of 3: 1 veh 2 of 3: 1 veh 3 of 3: 3 veh	**12**			2 of 3: 1 veh 1 of 3:1	**3**
4x	6	2 of 4: 1 veh 3 of 4: 1 veh 4 of 4: 1 veh	**9**	1 of 4: 2 veh 3 of 4: 1 veh 4 of 4: 2 veh	**13**			1 of 4: 2 veh	**2**
5x	1			5 of 5: 1 veh	**5**				
6x	2	4 of 6: 1 veh	**4**	2 of 6: 1 veh 5 of 6: 1 veh	**7**			1 of 6: 1 veh	**1**
9x	1	3 of 9: 1 veh	**3**	6 of 9: 1 veh	**6**				
11x	1	6 of 11: 1 veh	**6**	3 of 11: 1 veh	**3**	2 of 11: 1 veh	**2**		
20x eCall	1	4 of 20: 1 veh	**4**	12 of 20: 1 veh	**12**	1 of 20: 1 veh	**1**	3 of 20: 1 veh	**3**
23x	1	11 of 23: 1 veh	**11**	6 of 23: 1 veh	**6**	2 of 23: 1 veh	**2**	4 of 23: 1 vtg	**4**

How to read this table:

- the 1st column shows the number of eCalls received from a vehicle during the measurement period;
- the 2nd column shows the number of vehicles to which this applies.
  Example: there are 51 vehicles from which 2 eCalls were received, 102 eCalls in total;
- the 3rd column shows the number of those eCalls that got transferred, also showing the number per vehicle.
  Example: of those 102 eCalls 9 got transferred: from 5 vehicles 1 of the 2 eCalls, from 2 vehicles both eCalls.
- the combined 4th column show, per reason, similarly coded the number of eCalls not transferred.
  Example: of those 102 eCalls 91 are categorized as ‘Not 1-1-2’, 7 of those were one of the two eCalls from the vehicle, the other 84 were both eCalls (from 42 vehicles).

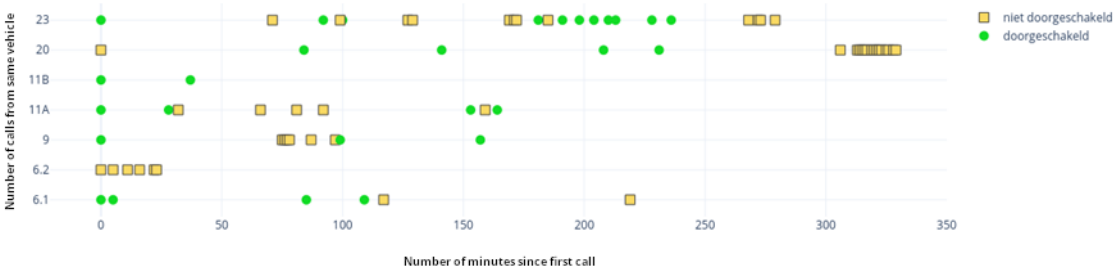
For vehicles from which a manual eCall is activated once, 87.8% of calls are not forwarded. If it is activated twice, in 86.3% of the calls there is no emergency assistance either time and in 9.8% of the cases once (in one case the calls took place shortly after each other). Both calls were forwarded for two vehicles (3.9%). In one case these calls took place within fifteen minutes of each other, in the other case they were three days apart.

EXCESSIVE REPETITION



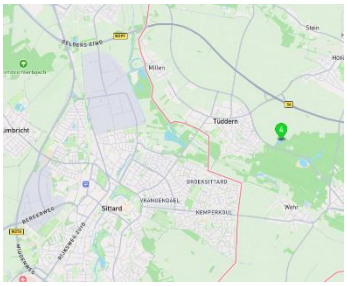
In total there are seven vehicles from which activation is done (manually) five times or more, in total 80 times. A further analysis indicates that the five calls from the same vehicle took place over three days and at different locations (see opposite). None of these calls were transferred.

For the other 75 calls, these all took place within 6 hours of each other. The exception is 11 calls from the same vehicle. The last two took place more than 24 hours after the first call. The distribution over the timescale looks like:

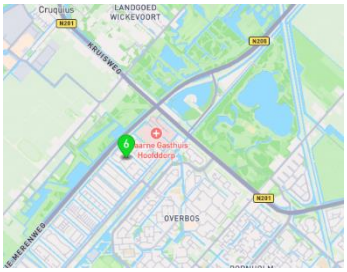


6.1 and 6.2 are two different vehicles (with six calls each) and 11A and 11B are two days of the same vehicle (with 11 calls). What is striking is that calls are transferred relatively often, but no system can be discovered (such as: only the first calls).
If we look at the locations, two situations can be distinguished. For vehicles “6.1”, “11” and “20”, the location (in all cases the location as included in the MSD) of the calls is always the same (per vehicle):

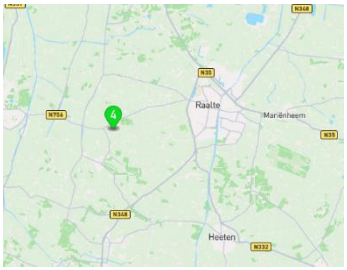
6.1



11



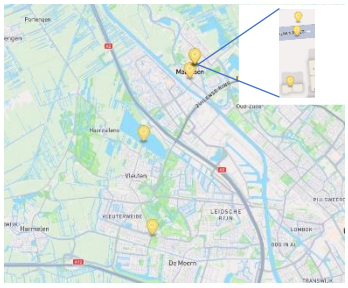
20



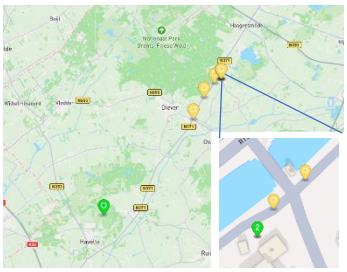
NB: the calls that were not forwarded also came from the same locations

The other vehicles have a movement pattern:

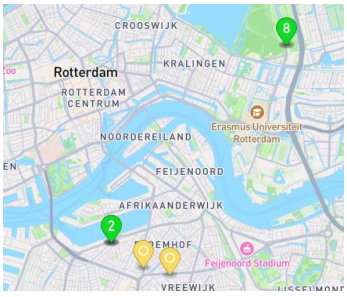
6.2



9



23

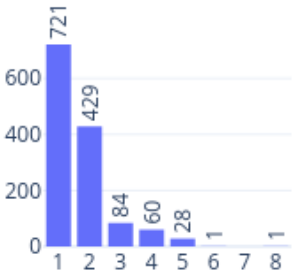


For vehicle “9”, the location of one of the calls that was not transferred is the same as that of one that was transferred. This is also the case with vehicle “23” and it is also striking that of the locations with two and eight calls forwarded, an equal number were not forwarded.

Based on the time course of the calls and the locations, the conclusion seems justified that there was no need for emergency assistance in these situations. This reduces the number of calls to **224** (was 252) and the percentage of emergency assistance for manual eCalls to **11.9%** . It should be noted that some other calls may have been calls about an incident already known.

Number of occupants

The number of occupants is an optional field in the MSD, where, due to the naming of the field (`numberOfPassengers`), there may be uncertainty about the meaning: occupants or passengers. Of the 2150 eCalls, it is not known how many people are present in the vehicle for **664 calls.** In another **162,** the number is 0 – which should probably be interpreted as 'one driver, no passengers.' For the other calls, the field is filled with a number between 1 and 8.



For one brand, information about the number of occupants is never available in the MSD. For other brands (insofar as sufficient eCalls have been received), it usually depends on the model and sometimes the date of manufacture - for those brands, occupant information is present in at least one eCall of each model.

Conclusions and recommendations

Of the 2150 calls in this effect measurement, **431** (**20.0%**) cases probably involved an emergency need. This low percentage is caused by the relatively high number of calls not forwarded to a regional control room. It is unclear what the reason for this is. It is also true that the fact that a call was forwarded is a trustworthy identifier for the need for emergency assistance - something that is evident from the forwarding pattern of repeat callers.

To better determine the effect in research like this, it is recommended to at least have (and use) the following categories among the reasons why a call is not transferred:

- Known incident – for calls about an incident that is already known.
- Usage error – for calls that are caused by incorrect usage (for example, pressing the wrong button in an eCall).
- No contact – for calls where the operator is unable to reach the caller and decides there is no emergency.

Follow-up research at the regional emergency centres can reveal whether there is actually an emergency need for diverted eCall calls or not.

In the first selection, more than 680 calls were not considered because the MSD contained unusable (and incorrect) information. As a result, it remains underexposed that most of these eCalls came from only two (2) SIM cards. More than 120 calls considered come from vehicles that place four or more (manual) emergency calls in a short time.
This means that in the month of December 2023, more than **28%** of eCalls come from ' frequent callers' who needlessly burden the 112 operation. Unlike normal 112 practice, where a human is always involved in the event of possible abuse, eCall can involve a technical malfunction with major consequences, like making the PSAP unreachable for eCalls.

It is therefore recommended to implement technical measures to prevent overloading of the emergency response chain by malfunctioning eCall devices. The following rules could be considered:

- All sources are eligible if they:
  - Have initiated an eCall more than five times in the past 30 minutes, or
  - Have initiated an eCall more than nine times in the past 14 days, where the operator has not classified any of these calls as emergencies.

- For these sources, all manual eCalls will be blocked. Automatic eCalls will only be blocked if another automatically triggered eCall was received within the 24 hours prior.

- Blocking involves playing a pre-recorded message informing the caller to contact 112 using a different device, if there is an emergency.

- Since eCalls provide a callback option, contact with the vehicle (either manually or automatically) can be established within one hour after a (first) blocked eCall, allowing additional information to be communicated to the occupants.

The information about the number of occupants is of limited use - it follows from the data received that the standard is interpreted differently. For one brand the number indicates the number of passengers (witness the often occurring value '0'), for other brands it is most likely the total number of occupants. Operators and emergency services should be aware of this. It is advisable to put in a request to improve the standard (EN15722) at this point at the next revision.

LOCATION DATA

An eCall conversation contains, in principle, some location data. The MSD includes at least the location where the eCall was activated. In addition, two previous locations may have been included. The location of eCall calls is also known based on the cell tower data.

Reliability of location data

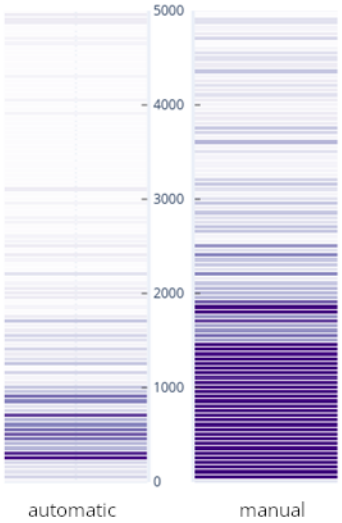
The MSD contains an indicator of whether the location could be reliably determined. The MSD location can also be compared with the cell tower location to get an idea of the reliability.

Indicator in MSD

In **212** of the 2150 conversations, the indicator in the MSD indicates that the location is not reliable. In **77** cases, no location is known, or it is invalid. In eCalls from one brand, the location is indicated significantly often as being unreliable - in approximately two-thirds of those cases, the location appears to be within a radius of 1 km from the location based on the cell tower data.

Difference between MSD location and cell tower location

In principle, MSD location and cell tower location should be relatively close to each other. The numbers of the distance between both locations (in blocks of 50 meters) are shown below. Of the **1830** calls for which both locations are known (and valid), the MSD indicates that the location is not reliable in **123 cases.** Of the remaining **1707 calls, 1164** (**68.2%)** MSD and cell tower locations are within 1 km of each other. It is striking that this is also the case with 84 conversations with an unreliable MSD location[12].
There is virtually no difference (relatively speaking) between automatically and manually activated eCalls . This is contrary to expectations, as the chance of the vehicle moving after initiation of a manual eCall is slightly higher than with an automatic eCall.



Further research, in particular to determine the actual incident location, should be carried out to be able to say something about the reliability of both location types.

It has previously been reported that no cell tower location is known for 242 calls, but a (valid) MSD location is known. In **230** of these, the MSD indicates that the location is reliable, in those cases the MSD location can help in the assistance process.

Recent locations and direction

The MSD offers the option to send two recent locations - this is optional, but mandatory in a newer version of the standard. Furthermore, the MSD contains a mandatory direction indicator, which indicates the compass direction of the vehicle at the time of initiation.

[12]This is mainly caused by calls originating from one specific car brand.

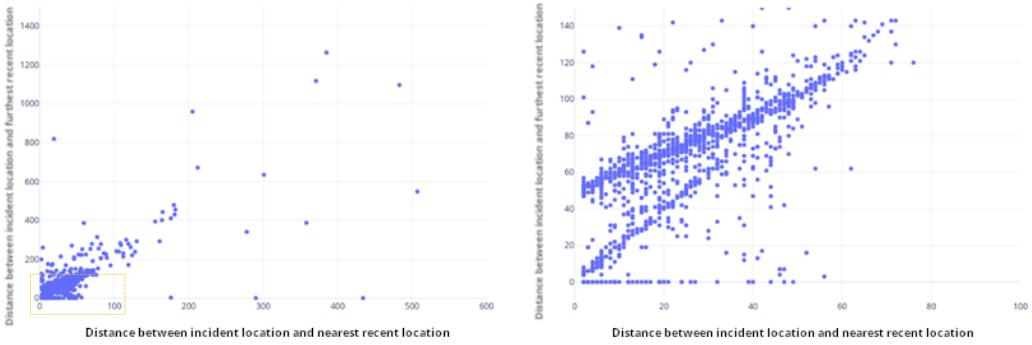
Recent locations

Of the **2072 calls with a valid incident location in the MSD, 1969** have at least one recent location. However, in 726 cases the recent location is the same as the incident location and therefore cannot be used to determine a direction of origin. Of the remaining **1243 calls, 1193 also** have a second recent location, which is valid and different from the first[13]. The table below provides a breakdown of automatically and manually initiated eCalls , which also includes the reliability indicator.

	Total	Trustworthy			Unreliable		
		Car	Hand	Total	Car	Hand	Total
Incident location and two recent ones[14]	**1193**	163	1021	**1184**	0	9	**9**
Incident location and one recent one[15]	**50**	8	37	**45**	0	5	**5**
Incident location only	**829**	90	618	**708**	1	120	**121**
Total	**2072**	**261**	**1676**	**1937**	**1**	**134**	**135**

DISTANCE BETWEEN LOCATIONS IN MSD

The standard does not include any requirements regarding the distance (in time or place) between the incident location and the recent location(s). In almost all conversations with one or two recent locations, these are within a radius of 1 km from the incident location, the **average** distance is respectively **33** and **87 meters**, the **medians** are slightly lower (**25** and **72 meters** respectively). Below, the distance between incident location and nearest recent location (x-axis) is plotted graphically against the distance to the furthest recent location (on the right is a section of the left graph):



It should be noted that, in most cases, when displaying the incident geographically, it is necessary to zoom in relatively far to see the displacement vector.

An important reason to have recent locations is because this allows a better statement to be made about the direction in which the vehicle was moving. Although the MSD also contains a direction indicator, this indicates the direction of the vehicle when the eCall has been triggered - so it may already have been influenced by the incident.

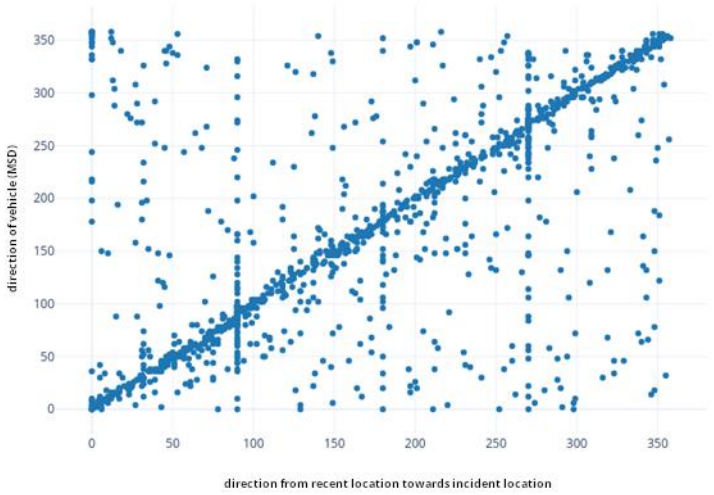
BRAND CORRELATION NUMBER OF LOCATIONS

All vehicle brands can send two recent locations, only vehicles from one brand-family do so quite consistently. Sending one recent location does occur, but is done to a limited extent.

[13] In 28 conversations, the second recent location is the same as the incident location.
[14] Valid, different from the incident location and from each other
[15] Valid and different from the incident location

Direction

In **373** of the 2150 eCalls the direction of the vehicle is unknown. For calls where at least two locations (incident and recent location) are available, the vehicle direction can be compared with the direction to get to the incident location from a recent location.



In the graph above, the direction of movement between both locations is plotted against the direction in the MSD. There is clearly a correlation, but at the same time there are also many situations where there is a clear difference. There may be a good reason for this, for example because a vehicle is turning. Such a situation is shown here - the vehicle came from the east, drove towards the west, but had already turned north at the time of the trigger.

Conclusions and recommendations

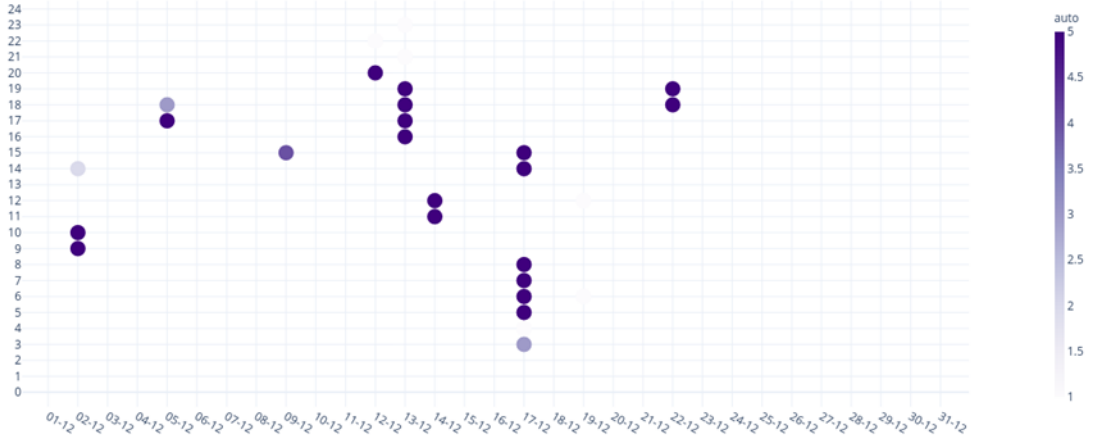
A proper map view of all weighed location information, can help draw a proper picture of the situation at the incident site.

APPENDIX: IGNORED CALLS

This analysis excluded **686** where (mandatory) MSD fields were missing and the VIN was clearly incorrect. The calls come from three different SIM cards, two with a Dutch M2M number - each good for more than 300 calls and a Danish M2M number. As far as can be determined, these calls are received as 'manual eCall'.

Although there is geographical concentration of the calls, not all calls come from the same location. This map shows the unique locations of the calls from the Danish SIM (purple) and the two Dutch SIMs (yellow and purple). For the latter, several locations are (very) frequently the same

The calls are received on several days in December and are then usually repeated during several hours:



APPENDIX: VEHICLE BRANDS

Without further investigation, the brand of the vehicle initiating an eCall does not reveal much in the context of this research. The number of eCalls is related to the number of vehicles of that brand that are on the road and equipped with eCall. One brand may only equip the models and types for which it is mandatory, while another brand may decide to equip all models with it. The timing of introduction can also vary: one brand may implement it from the moment it becomes mandatory, while another brand may have started earlier.

Further investigation could provide relevant information, for example, if there is indeed over-representation. This could indicate a (too) easily accessible button for manual calls or a malfunctioning triggering mechanism.

For this document, an alphabetical list of vehicle brands (based on information obtained through EUCARIS) from which at least one eCall has been received will suffice.

- ASTON MARTIN
- AUDI
- BMW
- BYD
- CUPRA
- DACIA
- FERRARI
- FIAT
- FORD
- HONDA
- HYUNDAI
- ISUZU
- KIA
- LAND ROVER
- LEXUS
- LOTUS
- LYNK&CO
- MAN
- MAXUS
- MAZDA
- MERCEDES
- MG
- NISSAN
- OPEL
- PEUGEOT
- POLESTAR
- PORSCHE
- RENAULT
- SEAT
- SKODA
- SMART
- SUZUKI
- TESLA
- TOYOTA
- VOLKSWAGEN
- VOLVO