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Validation of Risk Methodology 2010

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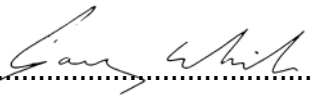

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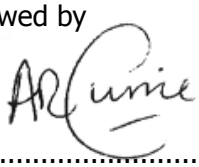

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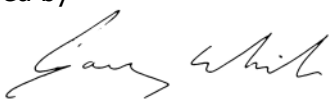

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ISSUE RECORD

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1.0	12-Jan-10	Initial issue to client.
2.0	14-Jan-10	Incorporating client comments

DISTRIBUTION

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CONTENTS

1 INTRODUCTION

1.1 Overview

Merseyside Fire and Rescue Service (MFRS) has developed the methodology on which the current Fire Risk Assessment Map (FRAM) for Merseyside has been determined. The FRAM has been produced to support the Integrated Risk Management Plan (IRMP) by categorising and setting out the risk to life from fire and other emergencies within Merseyside.

The FRAM will be used to assist MFRS in developing strategic priorities and also in development of MFRS Emergency Response Strategy.

1.2 Background

An evaluation of risk is a requirement of the current Fire and Rescue Service National Framework 2008-11, which is itself a requirement of the Fire & Rescue Services Act 2004 (as amended).

After much research conducted by external consultants to MFRS on the validity, priorities and usability of the Fire Service Emergency Cover Toolkit (FSEC) data, MFRS decided not to employ this data within their risk methodology as it was decided that the results were inconsistent with MFRS experience of the locations where incidents, injuries and fatalities occur. This variation is targeted towards the underlying assumption that determination of risk should correlate with reality of emergency occurrences and the severity of their outcomes.

1.3 Validation

This report presents a review and validation of the methodology applied by MFRS (Reference 1). The methodology developed by MFRS was reviewed to cover the following items:

- development of the methodology and the reasons for selection of the various criteria,
- development of the weightings applied within the methodology, and
- overall fitness for purpose.

This was achieved by reviewing documentation provided by MFRS followed up by a session with the team involved in developing the methodology at MFRS Headquarters.

2 REVIEW OF METHODOLOGY

In general, our review showed that significant effort had been expended by MFRS to ensure that all the datasets used were robust and that the methodology applied produced results that matched with the expert views of the FRS. We believe that the methodology used and datasets are fully transparent and robust enough to support the current findings of MFRS.

The following subsections take the key areas of methodology in turn:

- Geographical Area
- Time Period
- Incident Data
- Multiple Deprivation Indices
- Dataset Normalisation
- Dataset Weighing
- Risk Categorisation

2.1 Geographical Area

MFRS have chosen Lower Layer Super Output Areas (SOAs) as the basic geographical unit upon which all calculations have been made. The advantage of the SOAs is that they are all of consistent size (population) and this therefore removes the requirement to modify each dataset for the size of population in each area (this would have been required if using political boundaries, for example).

This approach is also consistent with the method used by the Office of National Statistics.

In addition, since SOAs are not subject to frequent boundary changes, they are more suitable for meaningful comparison over time.

Risktec support this decision in choice of geographic area as it both simplifies the methodology, allows the comparison over time and is consistent with the Office of National Statistics.

2.2 Time Period

When selecting historical incident data it is important to select a suitable period of time to ensure that sufficient data is collected to minimise the effect of single occurrences of large events.

While the time period selected (three years) would seem to be a good compromise (and is consistent with the government approach as used by the FSEC model), this does not apply to fatalities since only a small number of these occur in each year. MFRS have chosen to address this in the weighting applied to each dataset, and this is discussed in Section 2.6.

2.3 Incident Data

MFRS have chosen to focus on life risk in developing the FRAM. Incident datasets that therefore are appropriate to this focus have been selected:

- Dwelling Fires (All causes),
- All incidents where Injuries have occurred,
- Incidents where there has been a recorded Fire Death,
- Special Service Calls involving any risk to life,
- Any fire in non domestic premises which has been the result of a deliberate act.

Risktec agree that these datasets are all appropriate to assessing the likelihood of risk to life in each geographic area. In particular, using the incident pre-cursors (dwelling fires, special service calls and deliberate acts in non domestic properties) is linked to the wider practice of

tracking 'near misses' as this is best practice in identifying areas where injury / fatality may occur and allow earlier prevention.

2.4 Multiple Deprivation Indices

MFRS have chosen to use the latest version of IMD (IMD 2007) because of the proven causal factors of fire and other emergencies which are included within the calculations of the IMD score.

Research documentation has been published by Communities and Local Government (then ODPM) which establishes the strong correlation between fire related injury, death and deprivation.

As discussed in the previous section, this clearly follows best practice in identifying the underlying causes of risk to allow earlier prevention. In this methodology, this ensures that underlying causes are reflected in the overall risk score and thus directly influences the strategic decisions that will be taken, based on the guidance within the FRAM, following publication.

2.5 Dataset Normalisation

The individual datasets have a wide variation in their scores for each SOA. The effect of this would be that specific datasets could potentially have far greater effect on the overall score than other ones, with unintended consequences (for example, if dataset A has a maximum score of 10, whereas dataset B has a maximum score of 1000 then any overall score would be dominated by dataset B).

To prevent this, MFRS have normalised all of the datasets such that the score within each SOA is calculated as the percentage of the total for that dataset (i.e. if the total of all incidents in Merseyside is 1000 and there are 100 incidents in SOA 'A' then the score applied to SOA 'A' would be 0.1).

This solution does put each dataset on an equal footing, however these must now be weighted to ensure that each dataset reflects a realistic effect on the final score.

2.6 Dataset Weighting

The FSEC model does not aggregate the different components of risk and therefore, within the FSEC model, each component of risk can only be looked at individually. One of the underlying benefits of the new MFRS risk methodology is to aggregate the different components of risk, thus allowing MFRS resources to be prioritised on the overall risk (since there are not separate resources for separate risks).

In addition, it is clear that risk is not simply a sum of its components and therefore MFRS have applied weightings to each normalised dataset to ensure that each dataset affects the final score appropriately.

The datasets are weighted, in order of priority, by ensuring the potential underlying causes have the greatest effect on the final score (i.e. Dwelling fire incidents and IMD). The second priority is assigned to injuries and also special services affecting involving life risk. These are given a lower score. This both reflects relative importance of this compared to the underlying causes, but also to reflect that there are much fewer actual injuries and thus this has the potential to 'skew' the final score.

Finally, the datasets representing fire deaths and deliberate non domestic fires are weighted a factor of 10 lower than those representing injuries. This is extremely important to avoid the major skewing of the final score that could occur if a low weighting were not used. Taking Fire Deaths, given the low frequency of these then this would mean that any incident in an SOA would have a high percentage of the total (taken to extreme, if there is only a single fire death in Merseyside in a single year, then the SOA that this occurred in would score 100% which would far outweigh any of the other datasets).

It is often recognised in industry that there is a triangle in the consequences of an incident between fatalities and major and minor injuries on a typical scale of 1:0.1:0.01. This

weighting of the effect of fatalities by a factor of 10 fits in with that experienced in wider industry.

The weighting values were arrived at by combining professional judgement and a working group reviewing the effects of various weightings. The relative difference between the weightings appears to reflect best practise in ensuring that underlying causes have a significant effect on the final scores and that fire deaths are weighted lightly to ensure they do not 'dominate' or 'skew' the final score due to their low frequency of occurrence.

2.7 Risk Categorisation

MFRS have traditionally assigned the risks in each geographic area into 'Low', 'Medium' and 'High' groupings.

Areas designated as low risk, represent areas where there is an extremely small chance of fires or other emergencies occurring and the outcomes are generally likely to be less severe.

The Medium risk areas are defined as those areas where the hazards have already been identified and addressed to ensure they are as low as reasonably practicable.

High risk areas identify those areas where the focus in prevention and response will be until MFRS have reduced the risks within those areas to a medium risk level.

In attempting to sort each SOA into these bands, MFRS carried out a range of statistical techniques, including looking at the standard deviation of the data from the mean. However, the final dataset does not follow a normal distribution and therefore MFRS used professional judgement to select the scores at which they believe the boundaries of Low, Medium and High should be set.

This was reviewed at an internal MFRS working group and checked that the results matched the professional expectations of MFRS fire experts.

The setting of the boundaries for High, Medium and Low risk is clearly subjective, however has been done so as to fit with the professional judgement of MFRS professionals. In future years, however, Risktec would suggest that MFRS introduce a supplementary management measure to assess performance in reducing risk. This would require MFRS to track the relative movement in risk against the actual scores on the boundaries as defined for the current FRAM.

2.8 MFRS Risk Methodology Paper

The Risk Methodology Paper produced by MFRS presents the development of the methodology and shows the final FRAM. While the report covers all the necessary areas, Risktec have identified certain areas where rewording may make the report clearer for the general public.

Rather than identify these suggested textual changes in this document, a marked up version has been created and sent to MFRS alongside this report.

3 CONCLUSIONS

The work carried out by MFRS in developing the methodology and datasets to produce the Fire Risk Assessment Map is a robust and comprehensive piece of work, presenting data in a manner which is both transparent and easy to understand.

Certain suggestions have been made to clarify the text in the MFRS Risk Methodology Paper to allow this to be better understood by the general public.

One recommendation has been made which would introduce a supplementary management measure to assess performance in reducing risk.

4 REFERENCES

1) Merseyside Fire & Rescue Service. *Risk Methodology 2010*