Making Communities Safer

The main purpose of the Fire and Rescue Services in the UK is to provide an effective Emergency Service to the Community it serves. A key aspect of this is Community Safety and early intervention measures that can be introduced to reduce the risk of fire.

Merseyside Fire & Rescue Service (MF&RS) has focussed significant efforts into Community Safety programmes such as Home Fire Safety Checks (HFSC) which has significantly reduced the risk of fire.

Since 1999, when MF&RS moved significant resources into preventing fires, there are fewer home fires, fewer deaths and fewer fire related injuries, and the Service continue to find ways to improve, not only their emergency response but their approach to community fire safety.

MF&RS are currently involved in a Knowledge Transfer Partnership (KTP) with Liverpool John Moores University, developing a new, innovative way to analyse accidental dwelling fire risk in the Merseyside region. The KTP is based on previous research conducted by both organisations in 2007/08, where the possibility of a chaordic geographic information system framework was investigated. The current project involves developing the original concept and creating a system that will be operational within MF&RS by November 2010.

Background

As with any Fire and Rescue Service, MF&RS respond to Emergencies, and in doing so save lives, prevent injury, and prevent ecological and economical damage. Through its Community Safety programmes, MF&RS has lead the way in innovation around reducing risks within the home and Community. Currently, MF&RS, like other UK Fire and Rescue Services, use tools based on linear modelling to determine where accidental dwelling fires are likely to occur as a basis to determine where to promote certain community safety initiatives - however this assumes that accidental dwelling fires are systematic occurrences with defined causal factors. Accidental dwelling fires are more appropriately defined as random, unexpected occurrences, with numerous variables that can determine their event. For this reason, other ways of modelling risk would be required to give a better indication of where these incidents may occur.

One theory currently being tested through the KTP project is to look at accidental dwelling fires as a random occurrence that cannot be easily predicted. In order to do this, elements of the chaos theory were investigated, which attempts to make sense of where these incidents may occur. It was possible to model accidental dwelling fires using chaos theory concepts as fire has a tendency to be sensitive to the initial conditions that cause a fire to take hold, and incidents of accidental dwelling fire tend to cluster in certain areas.

Fire risk in particular can fluctuate greatly depending on a number of known causal factors. For example, smoking, binge drinking, living alone, disability and age are all factors that are known to affect the risk of a dwelling fire. Unfortunately, these factors tend to cluster in specific lower super output areas (LSOA) in the Merseyside region. Although the factors that increase ones risk from accidental dwelling fire can be identified, the model is classed as 'chaotic'. Within each LSOA, small fluctuations in the occurrence of these factors exist. For example, over time, there will be changes in the smoking and binge drinking patterns, percentage of homes owner occupied, percentage of elderly residents - these all affect fire risk.

A more suitable way to model fire risk would be to use the chaordic model. This attempts to create 'order from chaos'. Rather than attempting to model all changes in fire risk over Merseyside, which is lengthy and complex, a more suitable approach would be to model the data at a given point in time, or data averaged over a given time period. This chaordic model is a much more realistic approach that still allows for enhanced identification for fire risk and deployment of resources. Optimisation of the chaordic model determined how the model should be statistically analysed.

Currently, Fire and Rescue Services in the UK primarily use a modelling method based on linear regression, an analysis that assumes that occurrence of accidental dwelling fires are methodical, with the same defined causal factors for all. This is not the case so an approach based on multiple linear regression was used, which can measure the relationship between a number of variables. The output of statistical analysis is a single number that denotes the risk rating of a particular LSOA.

The risk map

Data used for this model comes from a number of sources, both MF&RS internal data and from external sources. The data sets required were collected from relevant organisations, such as the Department of Work and Pensions and the Office of National Statistics, and added into the statistical model. All data sets obtained were in an electronic format, and these were collated into a single database. Each LSOA in Merseyside has a list of accidental dwelling fire variables associated with it, which is analysed to give the risk rating. In the near future, MF&RS aim to access more refined risk data, allowing for identification of individual dwellings at risk. This will allow for identification of high risk dwellings in typically low risk areas.

Creating the risk map will be completed using the software package MapInfo, the standard GIS package used within MF&RS. Each LSOA will fall into one of three bands; high, medium or low risk, although these bandings can be altered to reflect future plans. The bandings used will reflect the Integrated Risk Management Plan (IRMP) for MF&RS, which is a statutory requirement for all Fire and Rescue Services to have in place. The data analysis will take place in the MapInfo programming module, MapBasic, which will

allow staff to alter the statistical analyses, if needed, when new data becomes available. This ensures the MF&RS will always have access to the most accurate and up-to-date risk model available.

The maps will have the facility to allow MF&RS staff to drill down further and look at the variables that determine the risk rating. This allows an understanding of why an area may be at high risk, allowing community fire safety staff within the service to take intervening action, tailoring their policies and strategies to suit communities. It also provides the opportunity to discover whether new initiatives can be created to suit the needs of Merseyside communities. Overall, use of this tool within MF&RS not only identifies where high-risk areas exist, but also provides users with a system that justifies promoting initiatives in specific areas.

Training programme

Part of the KTP project is to promote a transfer of knowledge between Liverpool John Moores University and MF&RS, in particular the Knowledge and Information Management and Community Safety Directorates. The final stage of the project, due to take place in summer 2010, will involve creating a training programme to ensure staff have the knowledge needed to use the model to its full potential and have the skills necessary to update the model, if needed. Material covered in the training sessions will also be included in an online help system. The aim of this final section of the KTP is to ensure that all staff are confident in using the new risk model, and aware of where to find information should they come across any problems.

Conclusions

Ultimately, the aim of any Fire and Rescue Service is to respond and provide an Emergency Service as well as promoting community safety. The KTP project allows MF&RS to look at new and innovative ways to achieve this goal. The major benefit to MF&RS from this project is the operational use of the risk assessment tool, developed through the KTP, will result in an additional and enhanced way of identifying risk and optimising available data to its full potential. Through understanding the causal factors of accidental dwelling fire and understanding why an area is classified as high risk, MF&RS can ensure that new policies and strategies are developed in line to suit the needs of communities in Merseyside.

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