**NIST Technical Note 2028**

**Community Risk Ratings for the FireCARES System**

Dr. Stanley Gilbert



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Dr. Stanley Gilbert

*Office of Applied Economics*

*Engineering Laboratory*

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Abstract

The FireCARES (Community Assessment Response Evaluation System) project is a web-based tool intended to help fire departments effectively match resources to community risk. Among other things, the analysis includes estimates of the community risk and estimates of effectiveness of response. This report documents the estimation of the community risk for fires, fire injuries, fire deaths, and emergency medical services calls. The community risk for fires is broken out by low- medium- and high-hazard properties as defined in NFPA Standard 1710.

Key words

Fire Risk;FireCARES;Fire;Injury;Death;EMS

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Abbreviations:

ACS: American Community Survey

BRFSS: Behavioral Risk Factor Surveillance System

CDC: (US) Centers for Disease Control

EMS Emergency Medical Services

FireCARES: Community Assessment Response Evaluation System

GLM: Generalized Linear Model

LASSO: Least Absolute Shrinkage and Selection Operator

NFIRS National Fire Incident Reporting System

NHIS: National Health Interview Survey

NFPA National Fire Protection Association

RMS Root Mean Square

RMSE Root Mean Square Error

# Introduction

The FireCARES project ([www.firecares.org](http://www.firecares.org)) is a web-based tool intended to help fire departments effectively match resources to community risk. Among other things, the analysis includes estimates of the community risk and estimates of effectiveness of response. This report describes the estimation of the community risk.

A literature review of the factors affecting death and injury in fires is in [1]. They found that the factors affecting the likelihood of death and injury in fires include age (and in particular, being older or very young), race (specifically black or American-Indian or Eskimo) gender, older homes, mobile homes, rentals, the lack of a smoke detector, and the use of alcohol and tobacco. For example, living in a low-income household or area is associated with a higher risk of injury in fire. The use of space heaters was associated with increased risk of death in fire.

As far as I am aware, no one has attempted to estimate the spatial risk for fire, injury or death, or emergency medical services (EMS) calls at the community-level.

This report is organized as follows: Section 2 describes the data used and the general approach to estimating community risk. Section 3 describes the analysis of community fire risk for low-hazard properties. Section 4 describes the analysis of community fire risk for medium-hazard properties. Section 5 describes the analysis of community fire risk for high-hazard properties. Section 6 describes the analysis of community “risk” for EMS calls. Section 7 concludes.

# General Approach

## Data

Data were from a number of different sources. The main data on fires and EMS calls were from the National Fire Incident Reporting System (NFIRS) [2]. NFIRS is a reporting system used by fire departments nationwide to report on their activities. The system is maintained by the US Department of Homeland Security through the United States Fire Administration and is designed to capture all activities engaged in by a fire department, including fires, EMS and community outreach. The system is voluntary at the national level, so not all departments use the system or contribute data to it. Data is obtainable from the United State Fire Administration. Department information was from the National Fire Department registry maintained by the US Fire Administration [3].

The NFIRS system records the time, date, and street address of all incidents, the type of the incident (e.g., fire, EMS call, hazardous materials incident, service call, etc.), property use, equipment and personnel on the call, number type and severity of casualties, actions take, and a host of other data. For fires specifically, NFIRS collects information on the size of the fire, room of origin, heat source, item first ignited, human and other factors contributing to ignition, presence and effectiveness of detectors and automatic suppression equipment among other data. Note, that this data is generated through firefighter data entry. The quality of this information is directly dependent on firefighters accurately entering data.

Fires and EMS calls were geocoded as part of the FireCARES project. Street addresses entered into NFIRS are not always validated, so geocoding was not 100 % effective. Geocoding percentage varied from department to department.

Department size classifications used in this work are shown in Table 1. Size classification is based on the classifications contained in the National Fire Protection Association (NFPA) Standard 1710 [2].

Demographic data was at the census tract level and was from the US Census’ American Community Survey (ACS). “The [ACS] is a nationwide survey designed to provide communities with reliable and timely social, economic, housing, and demographic data every year…. The ACS has an annual sample size of about 3.5 million addresses…. Data are pooled across a calendar year to produce estimates for that year. As a result, ACS estimates reflect data that have been collected over a period of time rather than for a single point in time…. [2]” This work uses the ACS 5-year estimates which are based on data pooled over a 5-year period.

Table 1: Size groups for departments

|  |  |  |
| --- | --- | --- |
| Size Group | Population Protected | |
| Minimum | Maximum |
| 0 | 0 | 2499 |
| 1 | 2500 | 4999 |
| 2 | 5000 | 9999 |
| 3 | 10 000 | 24 999 |
| 4 | 25 000 | 49 999 |
| 5 | 50 000 | 99 999 |
| 6 | 100 000 | 249 999 |
| 7 | 250 000 | 499 999 |
| 8 | 500 000 | 999 999 |
| 9 | 1 000 000 | no max |

Health information used in EMS estimation is from the Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS “is the nation's premier system of health-related telephone surveys that collect state data about U.S. residents regarding their health-related risk behaviors, chronic health conditions, and use of preventive services…. The BRFSS completes more than 400 000 adult interviews each year, making it the largest continuously conducted health survey system in the world. [3]” It is conducted by the 50 US States and compiled by US Centers for Disease Control (CDC).

As used in this report, the BFRSS data was drawn from two intermediate sources. County-level summaries of the BRFSS data were obtained from Robert Woods Johnson Foundation at [www.countyhealthdata.org](http://www.countyhealthdata.org) [7]. Census-tract level estimates of the BRFSS data were obtained from the 500-cities data set [5]. The 500-cities uses the BRFSS data and the techniques of small-area estimation [6] to estimate the values of the BRFSS survey questions at the census tract level for 500 U.S. cities.

A Social Vulnerability Index developed by the CDC is included. It is intended to be an aggregate index that represents the decree of vulnerability that a community has to disasters and hazards based on its social and demographic characteristics. [7]

For high risk and medium risk properties, some information at the Assessors’ Parcel level were used. Parcel data were from CoreLogic [11], which aggregates assessors’ parcel information for the entire country.

Information on smoking percentages at the state level are summarized from Census’ National Health Interview Survey (NHIS) which has been conducted since 1957. “The NHIS is a large-scale household interview survey of a statistically representative sample of the U.S. civilian noninstitutionalized population. Interviewers visit 35 000 to 40 000 households across the country and collect data about 75 000 to 100 000 individuals. [8]”

Each census tract was associated with a specific department as part of this estimation. In a number of cases, the NFIRS data reported multiple departments responding to fires in a single census tract. There were a number of reasons for this. In some cases, this was a simple product of a geolocation error. In other cases, it was a mutual aid call. Some census tracts are served by multiple departments. If NFIRS reported multiple departments responding to a particular tract, then the department responding to the most calls for that tract became the “owner” of the tract. In case of a tie, then the department with the department id first in alphabetical order was selected. Ties occurred in only about 2 % of cases.

Specific fields used in the analyses below, descriptions and their individual sources are listed in Appendix A.

Data from 2007 to 2013 was used to estimate the models.

Census tracts were filtered using the following filters:

* *base*

Tracts with any of the following characteristics were excluded:

* SVI < 0
* No reported median income
* No reported department size
* No reported County smoking data
* *small.x*

Departments (and tracts) are excluded if the department responded to fewer incidents than a specified floor, or if the number of incidents it responded to was an outlier compared to other years for the same department. The objective is to exclude years where reporting issues are a significant factor in the data. For low-hazard properties the definition of *small* varied depending on the model. Specifics of the various *small* filters are listed in Table 2. For all other risk models the ‘small.0a’ definition was used. The use of a variety of definitions for low-hazard properties made it possible to evaluate the effectiveness of the various definitions.

Table 2: *Small* Filters: Specific Definitions.

|  |  |  |
| --- | --- | --- |
| Filter | Floor | Outlier |
| small.0 | 25 |  |
| small.1 | 50 |  |
| small.2 | 100 |  |
| small.3 | 150 |  |
| small.4 | 200 |  |
| small.5 | 250 |  |
| small.6 | 500 |  |
| small.7 | 1000 |  |
| small.0a | 25 | x |
| small.1a | 50 | x |
| small.2a | 100 | x |
| small.3a | 150 | x |
| small.4a | 200 | x |
| small.5a | 250 | x |
| small.6a | 500 | x |
| small.7a | 1000 | x |

“Outlier” years were defined as those years which fell at least 2 standard deviations below the mean number of incidents for the department. Note that the “two standard deviations” standard is based on at most 7 years per department of data reported as part of the study.

* *giants*

Any tracts in the top 0.1 % for population, number of housing units, number of males, or people in the age range of 45 to 54 were excluded from model estimation. This was done because direct examination of the data indicated that many of these tracts were not linearly related to the rest of the data set and tended to have disproportionate influence on the model.

* *random\_subset*

One third of the tracts was selected at random and set aside to serve as a test set. The remaining tracts are used as the training set.

The total number of records for each property hazard group and the percent of records removed by each filter is listed in Table 3.

Table : Percent of records removed for each filter by property hazard level.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **N** | **Total** | **base** | **small** | **giants** |
| **Low Hazard** | 963 001 | 60 % | 59 % | 39 % | 1 % |
| **Medium Hazard** | 963 001 | 61 % | 60 % | 39 % |  |
| **High Hazard** | 1 845 431 | 49 % | 48 % | 29 % |  |
| **EMS: 500-cities** | 296 393 | 80 % | 80 % | 5 % |  |
| **EMS: county** | 296 393 | 70 % | 70 % | 5 % |  |

***Department Size × Region***

All departments serving fewer than 10 000 people (sizes 0 to 2 in Table 1 above) are excluded from the analysis. All departments nationwide serving one million or more people were analyzed together. For some models (more details below) departments in the Northeast in size group 8 (see Table 1) were combined with those in the size group 7.

## Models

All models except those for high-hazard properties are estimated at the census tract level. High-hazard properties are estimated at the Assessors’ parcel level.

Models fell into three broad categories: linear models, usually with department random effects; Random Forest models; and LASSO (least absolute shrinkage and selection operator) models.

All the linear random effects models were estimated using the techniques of generalized linear models (GLM), and had the following basic form:

|  |  |  |
| --- | --- | --- |
|  |  | (1) |

Where E is the expectation operator, *yijt* is the dependent variable being analyzed for the *i*th tract served by the *j*th department in year *t*, *g* is a linking function used in the glm analysis, *aijt* is a *known* offset value for the model, *xijt* are the predictors used for that observation, *βt* is the change per year, *β* are the parameter estimates, *ηj* is the department effect.

It is further assumed that

|  |  |  |
| --- | --- | --- |
|  |  | (2) |

where is the variance of the department effects, and is estimated as part of the model. What is reported in the model is . Specific values for the individual departments can be provided on request. The one exception to this was the models for high-hazard properties, which did not include department random effects.

It was assumed that the number of fires, EMS calls, injuries or deaths in a tract follow a (over-dispersed) Poisson process. An offset term is used to reflect the proportion of incidents that were geolocated by department. That should convert these estimates, based on geolocated EMS calls, fires, injuries or deaths, into a model of total EMS calls, fires, injuries or deaths.

It was assumed that fire size followed a binomial model. No offset was used for the fire size models because the number of relevant fires was already included as part of the model.

In Random Forest models [9], a small random sample is drawn from the data and a regression tree is fit to it. This is repeated a large number of times, and the results of the random trees is averaged for the result. For this to work, all variables were included in the random forest estimation except for the department random effects. For medium-hazard properties separate models with 500 and 2500 trees were grown. Since the difference between the two was minimal, all other models used only 500 trees for the random forest.

LASSO models [9] estimate a standard linear model, but with the addition of a penalty term on the magnitude of the parameters. The penalty is the sum of the absolute values of the predictors. This results in parameters that are smaller than they would be in a regular linear regression. In fact, due to the form of the LASSO model some parameters will have a value of exactly zero. A LASSO model was run for fires, fire deaths and injuries, and EMS calls. The offset term was included as part of the LASSO analysis, and all the variables listed above were included. A large number of LASSO models were run and compared using cross-validation over the training set. Two LASSO models were selected for evaluation against the test set: the model with the cross-validation minimum error (“min”), and the model with the largest cross-validated error within 1 standard error of the minimum (“1se”).

In addition, three naïve models were run for each analysis: a constant model, a pure department effects model, and a “tract” model. The constant model fits a single constant to the data (and does not include department effects). In effect, it assumes that all tracts have the same (average) expected value per year. The department-effect model fits the department effects only to the data. In effect, it assumes that all tracts served by a particular department have the same expected value per year. The “tract” model predicts that the value for a tract would be the same as the value for that tract experienced in the previous year. Since the dataset did not include 2006, no estimate was made for 2007 for the tract model.

Geocoding is incomplete and varies by department and year. All models (except for the fire-size models) are adjusted for geocoding percentage at the department × year level, by including the geocoding percentage of all reported incidents (by department and year) as an offset to the model.

## Analysis Groups

Several separate analyses are conducted as part of this work to estimate community risk. Fires (and fire-related quantities) are analyzed separately based on fire hazard types as defined in NFPA Standard 1710 [10]. In the standard, low-hazard properties consist of one-, two- or three-family dwellings and scattered small business and industrial occupancies. Medium hazard properties consist of apartments, offices, mercantile and industrial occupancies not normally requiring extensive rescue by firefighting forces. High-hazard properties consist of schools, hospitals, nursing homes, explosive plants, refineries, high-rise buildings and other high life hazard or large fire potential occupancies. There is a low-hazard occupancy fire-risk estimate, a medium hazard occupancy fire-risk estimate, etc. For each hazard type, fire risk is estimated as well as injury and death risk from fire, estimates of the proportion of fires that grow beyond the room of origin, and estimates of the proportion of fires that grow beyond the structure of origin.

A separate analysis is conducted of EMS risk.

The discussion below is structured based on property hazard levels (for fires and fire-related quantities) and EMS calls.

# Fire Risk in Low-Hazard Properties

In this section a series of models are presented that model community risk levels for number of fires, fire size, and number of fire injuries and deaths in low-hazard properties.

Predictors used in the model were organized into subgroups to simplify model selection for most models. The groups are summarized in Table 4 (see Appendix A for definitions of the variables).

A large number of different linear models were run, each with different combinations of the groups of predictor variables listed above. The models fall into two main classes. In the first group (labeled ‘L’), separate models were estimated for each region × department size group of departments (while excluding the ‘region’ group from the analysis). In the second group (labeled ‘S’), all models were estimated over the entire data set while including the ‘region’ dummies.

***Results***

All models are estimated against the training set. Then the estimated model is used to predict number of fires (or percent of fires for fire size, or fire injuries or deaths, depending on the model) for each tract in the test set. Then for each model the Root Mean Square error (RMSE) of the predicted value is calculated for the test set. Note that all models (except the “constant” model, the random forest model, and the LASSO model) reported here include a department dummy as part of the model estimate. All “Dummies” models also include dummies for department size and region, in addition to the variables listed. There are a few tracts in the test set associated with departments which do not appear in the training set and, therefore, for which no department dummy could be estimated. In those cases, the department dummy for that department was arbitrarily assigned a value of zero, effectively assuming that it behaves like the “average” department.

In all cases below, the test set was restricted to departments serving 100 000 people or more. Since much of the model testing for low-hazard properties involved different definitions of *small*, a test set was needed that used a criterion different from the various *small* filters. The restriction based on department size was deemed the best way of determining what effect the various *small* filters had on predictions for the departments that will most likely be using the FireCARES system. Note that the test set against which RMSE was computed stayed the same regardless of the definition of the *small* filter used. That enabled an “apples to apples” comparison when assessing the effectiveness of the various models.

Table 4:Predictor groups used for low-hazard property models.

|  |  |  |
| --- | --- | --- |
| Group | Terms | Source |
| **Time** | Year, with 2014 being zero | NFIRS |
| **Base** | population, number of males, and hse\_units | ACS |
| **Race** | black, amer\_es, other, hispanic, | ACS |
| **Age** | age\_under5, age\_5\_9, age\_10\_14, age\_15\_19, age\_20\_24, age\_35\_44, age\_45\_54, age\_55\_64, age\_65\_74, age\_75\_84, age\_85\_up | ACS |
| **House** | vacant, renter\_occ, crowded, sfr,units\_10, mh, older | ACS |
| **Personal** | inc\_hh, svi, married, unemployed, nilf, smoke\_st, smoke\_cty | ACS |
| **Fuel** | fuel\_gas, fuel\_tank, fuel\_oil, fuel\_coal, fuel\_wood, fuel\_solar, fuel\_other, fuel\_none | ACS |
| **Region** | region, fd\_size, | FireCARES |
| **Department** | fd\_id | FireCARES |

Results are reported in Appendix B. Comparing the results to the averages per tract in the test set indicates that the models for fires, fire injuries and deaths are still over-dispersed relative to a Poisson model. Overfitting of the models is apparent for many models estimating fire size, fire injuries or deaths. It is a severe problem for deaths.

For the most part, the best models compare well to the naïve models. As a rule, about half the reduction in variance is attributable to the department effect. The “tract” naïve model beats the other model for fires, but does poorly for all the other models. Remember that the tract ID contains a lot of information, including department ID and all the census data. That is why it performs so well against the fire models. However, once the event being predicted becomes rare (e.g., 88 % of the time there are zero injuries in a tract), then the tract label contains only a little information about occurrence. So, pooling information about similar tracts, which is essentially what the models do, improves the prediction.

# Fire Risk in Medium-Hazard Properties

In this section a series of models are estimated that model community risk levels for number of fires in medium-hazard properties, fire size, and number of fire injuries and deaths for medium-hazard properties.

As with low-hazard properties, predictors used in the model were organized into subgroups to simplify model selection for most models. The groups are summarized in Table 5.

A large number of different linear models were run, each with different combinations of the groups of predictor variables listed above. The models fall into two main classes. In the first group, separate models for each region × department size group of departments were estimated (while excluding the ‘region’ group from the analysis). In the second group, all models were estimated over the entire data set while including the ‘region’ dummies.

***Results***

All models are estimated against the training set. Then the estimated model is used to predict the number of fires (or percent of fires for fire size, or fire injuries or deaths, depending on the model) for each tract in the test set. Then for each model the RMSE of the predicted value is calculated for the test set. Note that all models except the constant, LASSO and random forest models, include a department dummy as part of the model estimate. All “Dummies” models, and the LASSO and random forest models also include dummies for department size and region, in addition to the variables listed. There are a few tracts in the test set associated with departments which do not appear in the training set and, therefore, for which no department dummy could be estimated. In those cases, the department dummy for that department was arbitrarily assigned a value of zero.

In all cases below, the test set is restricted to departments serving 100 000 people or more. This is consistent with the test set used in the low-hazard property models.

Results are reported in Appendix C. Comparing the results to the averages per tract in the test set indicates that the models for fires, fire injuries and deaths are still over-dispersed relative to a Poisson model. Overfitting of the models is apparent for many models estimating number of fires, fire size, fire injuries or deaths.

Table 5:Predictor groups used for medium-hazard property models.

|  |  |  |
| --- | --- | --- |
| Group | Terms | Source |
| **Time** | Year, with 2014 being zero | NFIRS |
| **Base** | pop, males, and hse\_units | ACS |
| **Race** | black, amer\_es, other, hispanic, | ACS |
| **Age** | age\_under5, age\_5\_9, age\_10\_14, age\_15\_19, age\_20\_24, age\_35\_44, age\_45\_54, age\_55\_64, age\_65\_74, age\_75\_84, age\_85\_up | ACS |
| **House** | vacant, renter\_occ, crowded, sfr, units\_10, mh, older, apt\_parcels, mr\_parcels | ACS, CoreLogic |
| **Personal** | inc\_hh, svi, married, unemployed, nilf, smoke\_st, smoke\_cty | ACS |
| **Fuel** | fuel\_gas, fuel\_tank, fuel\_oil, fuel\_coal, fuel\_wood, fuel\_solar, fuel\_other, fuel\_none | ACS |
| **Region** | region, fd\_size, | FireCARES |
| **Department** | fd\_id | FireCARES |

For fires, the random forest model handily beat all other models except for the “tract” model. That is particularly impressive considering that the random forest models do not include department effects. The “tract” naïve model did very well for fires, but poorly for all the other effects. As with low risk fires, the tract ID contains a lot of information, including department ID and all the census data, but for fire injuries and deaths contains little information about occurrence.

For fire deaths, the LASSO model is the best predictor.

# Fire Risk in High-Hazard Properties

In this section a series of models are estimated that model community risk levels for number of fires in high-hazard properties, fire size, and number of fire injuries and deaths for high-hazard properties.

Unlike in the previous analyses, this analysis operates at the parcel level. Predictions are rolled up to the census tract level for FireCARES.

Predictors used in the model were organized into subgroups to simplify model selection for most models. The groups are summarized in Table 6.

Occupancy class was included in the set of predictors because the risks presented by the different classes of properties were expected to be different. Occupancy class was included in all models. The remaining groups where included in some models but not all.

***Data***

Risk for high-hazard properties was determined differently from the determination for low and medium hazard properties. Risk was estimated at the parcel level.

Parcels were selected from the CoreLogic data set based on the specific properties identified by the FireCARES team from other data sets. Fires were identified based on their geocoded location. Any fire that overlapped the bounding box for a high-risk parcel and was a structural fire (any NFIRS incident type beginning with ‘11’) was included as a high-risk fire and associated with the overlapping parcel. Note that the bounding box is guaranteed to be at least as large as the parcel, and in most cases will be bigger.

There are several potential problems with the incident selection approach. First it seems likely that some incidents at high-hazard properties were not included due to poor quality geocoding. Second, it seems likely that some non-high-hazard incidents were included, both due to geocoding issues and due to the fact that bounding boxes are often bigger than the actual parcels. Since high hazard parcels are a small percentage of the total number of parcels in the data set, the first effect seems likely to have a bigger effect than the latter.

Table 6:Predictor groups used for high-hazard property models.

|  |  |  |
| --- | --- | --- |
| Group | Terms | Source |
| **Time** | Year, with 2014 being zero | NFIRS |
| **Base** | pop, males, and hse\_units | ACS |
| **Race** | black, amer\_es, other, hispanic, | ACS |
| **Age** | age\_under5, age\_5\_9, age\_10\_14, age\_15\_19, age\_20\_24, age\_35\_44, age\_45\_54, age\_55\_64, age\_65\_74, age\_75\_84, age\_85\_up | ACS |
| **House** | vacant, renter\_occ, crowded, sfr, units\_10, mh, older | ACS |
| **Personal** | inc\_hh, svi, married, unemployed, nilf, smoke\_st, smoke\_cty | ACS |
| **Occupancy** **Class** | occ\_class | CoreLogic |
| **High Rise** | hr\_floors | CoreLogic |
| **Region** | region, fd\_size, | FireCARES |
| **Department** | fd\_id | FireCARES |

Third, there are likely cases where the same incident is associated with more than one high-hazard parcel due to the fact that bounding boxes are (in some cases) larger than the parcels themselves. This problem was addressed by ‘unioning’ any overlapping high-hazard parcels into a single parcel group. Thus, if multiple parcels are in the same location, they are combined into a single parcel group, and then the parcel groups are matched to fires.

Table 7: Number of CoreLogic parcels by risk level

|  |  |  |
| --- | --- | --- |
| **CoreLogic Land Use** | **FireCARES** | |
| **'High'** | **Low / Med** |
| High | 66 871 | *721 506* |
| Medium | *228 804* | 13 273 678 |
| Low | *24 452* | 94 785 759 |
| (blank) | 658 | *139 132* |

Since the approach used to identify high hazard parcels is different from that used to identify low and medium hazard parcels, the possibility exists of parcels being identified as both as high and medium or low hazard, and of parcels that end up unclassified. Table 7 lists the number of parcels in the CoreLogic data set by both their CoreLogic categorization and by their FireCARES categorization. Italicized groups are either double-counted or excluded.

As with the other classes of fires, geocoding is incomplete, and varies by department and year. This model adjusts for geocoding percentage at the department × year level, by including the geocoding percentage of all reported incidents (by department and year) as an offset to the model.

Different from the other property hazard groups, a department effect was not included.

***Results***

All models are estimated against the training set. Then the estimated model is used to predict number of fires (or percent of fires for fire size, or fire injuries or deaths, depending on the model) for each parcel in the test set. Then for each model the RMSE) of the predicted value is calculated for the test set. All “Dummies” models, and the LASSO and random forest models also include dummies for department size and region, in addition to the variables listed.

Since department effect was not included in this model, no pure-department effect naïve model was estimated. Instead a pure risk-class naïve model was estimated. It assumes that all tracts in the same risk-class have the same expected value per year.

In all cases below, the test set is restricted to departments serving 100 000 people or more. This is consistent with the test set used in the low-hazard property models.

Results are reported in Appendix D. Overfitting is a noticeable problem for fire deaths and injuries. The random forest model is the best for everything except injuries. For injuries the best model is likely the model labeled “hr.0101011” for the “separate” class of models. However, there are many models that are very similar to that model and are likely indistinguishable from it.

# EMS “Risk”

In this section a series of models are estimated that model community risk levels EMS calls.

For EMS risk, two separate groups of models were run, depending on whether health information is from the 500-cities project or from countyhealthrankings.org. Since the 500-cities project provides data estimated at the census tract level, it is better suited to this analysis, but it does not cover the entire country. While the countyhealthrankings.org data is only at the county level, it is available for the entire country. The intent is to use the estimates based on the 500-cities data for those portions of the country where it is available, and to use estimates based on the countyhealthrankings.org data for the rest of the country.

**County Clusters**

The County Health Data and the ACS were summarized by county and clustered into nine clusters using the *pam* algorithm, part of the cluster package [11] in R [12].

All the data from the ACS and countyhealthrankings.org [4] used in the EMS analysis was used here for clustering by county. ACS Data was rolled up to the county level where necessary. For most columns, that amounted to summing up the column values for all tracts in a county. In a few cases (e.g., number of people per household), a weighted average was computed. All columns were standardized by mean and standard deviation before estimation of the clusters.

One cluster was dropped because it had no departments with EMS data. Each cluster represents a set of counties that are more similar to each other than they are to counties in other clusters. Figure 1 shows a map of the clustered counties.

As with the fire risk models, there were several different groups of linear models. The first group (labeled “S” for “Short”) estimated a single model against the entire data set. This version always included the “regional” group of terms. The second group (labeled “L” for “Long”) estimated separate models against each region × department-size group. Details are discussed in Section 2.1 above. The third group (labeled “C” for “Cluster” was unique to EMS risk) estimated separate models for each cluster.

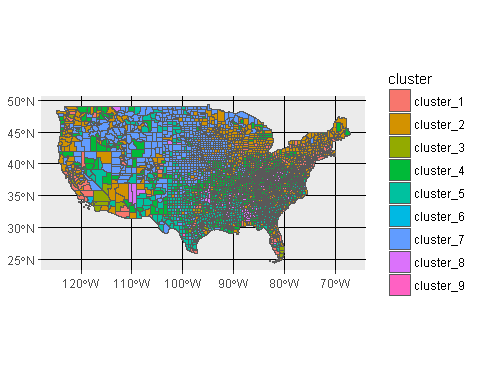


Figure 1: US Counties by cluster.

Predictors used in the model were organized into subgroups to simplify model selection for most models. The groups are summarized in Table 8 and Table 9.

Table 8: Predictor groups used for the '500-cities' EMS models.

|  |  |  |
| --- | --- | --- |
| Group | Terms | Source |
| Year | year | NFIRS |
| Base | ave\_hh\_sz, pop,males | ACS |
| Demographic | black, amer\_es, other, hispanic, age\_under5, age\_5\_9, age\_10\_14, age\_15\_19, age\_20\_24, age\_35\_44, age\_45\_54, age\_55\_64, age\_65\_74, age\_75\_84, age\_85\_up | ACS |
| Housing | hse\_units, vacant, renter\_occ, crowded, sfr,units\_10, mh,older | ACS |
| Personal | inc\_hh, svi, married, unemployed, nilf | ACS |
| Fuel | fuel\_gas, fuel\_tank, fuel\_oil, fuel\_coal, fuel\_wood, fuel\_solar, fuel\_other, fuel\_none | ACS |
| Health1a | arthritis, bphigh, cancer, casthma, chd,copd, diabetes, highchol, kidney, mhlth, phlth, stroke, teethlost | 500-Cities |
| Health2a | access2, binge, csmoking, lpa, obesity, sleep, bpmed, checkup, cholscreen, colon\_screen, corem, corew, dental, mammouse, paptest | 500-Cities |
| Region | region, fd\_size, cluster | FireCARES |
| Department | fc\_dept\_id | FireCARES |

**Analysis**

Results are listed in Appendix E.

A number of models fail for some subgroups. The typical reason for a model to fail is that some of the explanatory variables are collinear. This problem occurs in two cases. In one case, the subgroup analyzed is so small that estimation fails for even a moderate number of variables. The second case arises only for the county set of models. For the county models, the health-related information is the same for all tracts in a county. However, for some subgroups there are so few counties that even a moderate number of health-related variables present problems. That applies even though there may be thousands of tracts to work with.

There is very little that can be done for the first case. Since those subgroups inherently have few departments, tracts, EMS calls and people, those cases are ignored. The second case potentially presents serious problems, since some of those subgroups have large populations.

In Appendix E, any model that runs into problems of the second type are identified. Any model with those problems is not considered in identifying the best models for subsequent analysis.

There were no problem models in the 500-cities data set. The best model in that set was ems.5.124S with an RMSE of 362.9.

There were a large number of problem models in the county-based data set. After removing those from consideration, the best model in that set was ems.C.031C with an RMSE of 329.0.

Table 9: Predictor groups used for the 'County' EMS models.

|  |  |  |
| --- | --- | --- |
| Group | Terms | Source |
| Year | year | NFIRS |
| Base | ave\_hh\_sz, pop,males | ACS |
| Demographic | Black , amer\_es, other, hispanic, age\_under5, age\_5\_9, age\_10\_14, age\_15\_19, age\_20\_24, age\_35\_44, age\_45\_54, age\_55\_64, age\_65\_74, age\_75\_84, age\_85\_up | ACS |
| Housing | hse\_units, vacant, renter\_occ, crowded, sfr, units\_10, mh, older | ACS |
| Personal | inc\_hh, svi, married, unemployed, nilf | ACS |
| Fuel | fuel\_gas, fuel\_tank, fuel\_oil, fuel\_coal, fuel\_wood, fuel\_solar, fuel\_other, fuel\_none | ACS |
| Health1b | diabetes, years\_lost, poor\_health, days\_pr\_hlth, days\_pr\_mntl, low\_birthwt, early\_mortality, child\_mortality, infant\_death, hiv | RWJ |
| Health2b | binge, csmoking, lpa, obesity, food\_ndx, exercise\_place, dui, stds, teen\_births, drug\_overdose, mv\_deaths, lack\_sleep | RWJ |
| Health3b | access2, physicians, dentists, shrinks, wrong\_hosp, diabetic\_scrn, mammography, nurses, pm10, house\_probs, drive\_alone, long\_commute, high\_school, college, child\_pov, inequality, child\_sngl\_prnt, social, violent, injury\_dths, food\_insecurity, no\_healthy\_food, uninsured\_adult, uninsured\_child, hlth\_cost, free\_lunch, segregation1, segregation2, homicide, rural | RWJ |
| Region | region, fd\_size, cluster | FireCARES |
| Department | fc\_dept\_id | FireCARES |

# Conclusions

This report documents the methods used to estimate community risk levels for the FireCARES project. Community risk levels were estimated for fires, fire injuries and fire deaths for low- medium- and high-hazard properties. Risks were estimated at the census tract level. In addition, community risk levels were estimated for EMS services.

The best models, and the models selected for production risk estimation, are listed in Table 10.

In most cases the model with the lowest RMS error was used. In a few cases a different model was selected. Where the difference in RMS errors was small, models with fewer predictors were preferred (and in particular “S” type models, i.e., models where the entire sample was estimated as a single model with dummies for department size and region were preferred over “L” type models). Models with time in the set of predictors were preferred to those without. Since random forest shows up as the model with the lowest RMS error for six out of the 17 test cases (and there were a number of other cases where it had an RMS error very close to the best) random forest was preferred to linear models.

With those considerations, the production models for fire size for low-hazard properties were used because they were more parsimonious than the base models. The production models for fires in medium hazard properties were used because they included time and the lowest RMS error models did not. The fire injury model for high-hazard properties was chosen because it was an “S” type model and the lowest RMS Error model was not. Random forest was chosen for the EMS “county” model because it had an RMS error very close to the lowest RMS error.

Table 10: Best models and models selected for FireCARES production use.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **Lowest RMS Error** | | **Production Model** | | |
| **Model Group** | **Measure** | **Model** | **RMS Error** | **Model** | | **RMS Error** |
| Low Hazard | Fire | rForest | 2.3859 | <same> | | |
| Low Hazard | ‘Medium’ Fires | base.S | 0.3895 | M100111.S | 0.3895 | |
| Low Hazard | ‘Large Fires | base.S | 0.2697 | M100111.S | 0.2697 | |
| Low Hazard | Fire Injury | M111110.S | 0.6254 | <same> | | |
| Low Hazard | Fire Death | LASSO | 0.1768 | <same> | | |
| Medium Hazard | Fire | rf.0500 | 2.9066 | <same> | | |
| Medium Hazard | ‘Medium’ Fires | mr.011110.S | 0.4064 | mr.111110.S | | 0.4066 |
| Medium Hazard | ‘Large Fires | mr.101110.S | 0.3020 | <same> | | |
| Medium Hazard | Fire Injury | mr.000101.L | 0.3754 | mr.100101.L | | 0.3755 |
| Medium Hazard | Fire Death | LASSO | 0.0831 | <same> | | |
| High Hazard | Fire | rForest | 0.6190 | <same> | | |
| High Hazard | ‘Medium’ Fires | rForest | 0.1597 | <same> | | |
| High Hazard | ‘Large Fires | rForest | 0.1948 | <same> | | |
| High Hazard | Fire Injury | hr.0101011.L | 0.1341 | hr.1110111S | | 0.1352 |
| High Hazard | Fire Death | rForest | 0.0092 | <same> | | |
| EMS | 500-Cities | ems.5.124.S | 362.9 | <same> | | |
| EMS | County | ems.C.031.C | 329.0 | rForest | | 330.1 |

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# Appendix A: Variables and Data Sources

| **Predictor** | **Description** | **Source** |
| --- | --- | --- |
| year | year, with 2014 as zero | NFIRS |
| region | Census Region | NFIRS |
| fd\_id | Department ID | NFIRS |
| fd\_size | Department Size (See Section 2.1) | NFIRS |
| cluster | Cluster (see Section 6) |  |
| f\_located | proportion incidents geolocated | NFIRS |
| c\_located | proportion ems incidents geolocated | NFIRS |
| ave\_hh\_sz | Average household size | ACS |
| pop | Population | ACS |
| black | Number of black people in census tract | ACS |
| amer\_es | Number of american indian/eskimo people in census tract | ACS |
| other | Number of people whose race is not white, black or amer\_es | ACS |
| hispanic | Number of hispanics | ACS |
| males | Number of males | ACS |
| age\_under5 | Number of people whose age is < 5 | ACS |
| age\_5\_9 | Number of people whose age is between 5 and 9 | ACS |
| age\_10\_14 | Number of people whose age is between 10 and 14 | ACS |
| age\_15\_19 | Number of people whose age is between 15 and 19 | ACS |
| age\_20\_24 | Number of people whose age is between 20 and 24 | ACS |
| age\_25\_34 | Number of people whose age is between 25 and 34 | ACS |
| age\_35\_44 | Number of people whose age is between 35 and 44 | ACS |
| age\_45\_54 | Number of people whose age is between 45 and 54 | ACS |
| age\_55\_64 | Number of people whose age is between 55 and 64 | ACS |
| age\_65\_74 | Number of people whose age is between 65 and 74 | ACS |
| age\_75\_84 | Number of people whose age is between 75 and 84 | ACS |
| age\_85\_up | Number of people whose age is 85 or higher | ACS |
| hse\_units | Number of housing units | ACS |
| vacant | Number of housing units vacant | ACS |
| renter\_occ | Number of renter-occupied housing units | ACS |
| crowded | Number of housing unit with more people than rooms | ACS |
| sfr | Number of single-family residences | ACS |
| units\_10 | Number of housing units part of a 10-unit or larger complex | ACS |
| mh | Number of mobile homes | ACS |
| older | Number of homes built before 1980 | ACS |
| apt\_parcels | Number of Assessors parcels zoned for apartments | CoreLogic |
| mr\_parcels | Number of assessors parcels zoned commercial | CoreLogic |
| inc\_hh | Average household income | ACS |
| svi | Social Vulnerability Index | ACS |
| married | Number of married people | ACS |
| unemployed | Number of unemployed | ACS |
| nilf | Number of people older than 15 and not in labor force | ACS |
| smoke\_st | % of smokers in state | NHIS |
| smoke\_cty | % of smokers in the county | county health |
| fuel\_gas | Number of households using gas for heating | ACS |
| fuel\_tank | Number of households using tanked gas for heating | ACS |
| fuel\_oil | Number of households using oil for heating | ACS |
| fuel\_coal | Number of households using coal for heating | ACS |
| fuel\_wood | Number of households using wood for heating | ACS |
| fuel\_solar | Number of households using solar for heating | ACS |
| fuel\_other | Number of households using another fuel for heating | ACS |
| fuel\_none | Number of households without heating | ACS |
| bld\_units | Number of building units on a parcel | CoreLogic |
| hr\_floors | Number of floors | CoreLogic |
| eff\_year | Year built | CoreLogic |
| risk\_class | One of “Assembly,” “High Rise,” “Industrial,” “Institutional,” “Medical,” and “School.” | CoreLogic |
| arthritis | % of adults with arthritis | 500-Cities |
| bphigh | % of adults with high blood pressure | 500-Cities |
| cancer | % of adults who have ever had cancer | 500-Cities |
| casthma | % of adults who currently have asthma | 500-Cities |
| chd | % of adults with coronary heart disease | 500-Cities |
| copd | % of adults with Chronic obstructive pulmonary disease | 500-Cities |
| diabetes | % of adults with diabetes | 500-Cities |
| highchol | % of adults with high cholesterol | 500-Cities |
| kidney | % of adults with chronic kidney disease | 500-Cities |
| mhlth | % of adults with poor mental health for >= 14 of the last 30 days | 500-Cities |
| phlth | % of adults with poor health for >= 14 of the last 30 days | 500-Cities |
| stroke | % of adults who have had a stroke | 500-Cities |
| teethlost | % of adults who have lost all their teeth | 500-Cities |
| access2 | % adult uninsured | 500-Cities |
| bpmed | % of those prescribed who are taking blood pressure meds | 500-Cities |
| checkup | % of adults who have had a checkup in the last year | 500-Cities |
| cholscreen | % of adults who have had cholesterol screening in the last 5 years | 500-Cities |
| colon\_screen | % of adults 50-75 who have had colon exam | 500-Cities |
| corem | % of men >=65 who have had a set of core medical services | 500-Cities |
| corew | % of women >=65 who have had a set of core medical services | 500-Cities |
| dental | % of adults who have been to the dentist in the last year | 500-Cities |
| mammouse | % of women 40-75 who have had a mammogram in the last 2 years | 500-Cities |
| paptest | % of women 21-65 who have had a pap smear in the last 3 years | 500-Cities |
| binge | % of adults "binge" drinking in the last 30 days | 500-Cities |
| csmoking | % of adults who are current smokers | 500-Cities |
| lpa | % of adults with no leisure physical activity in the last month | 500-Cities |
| obesity | % of adults who are obese | 500-Cities |
| sleep | % of adults averaging <7 hours of sleep per night | 500-Cities |
|  |  |  |
| years\_lost | Estimated years of potential life lost before age 75 | county health |
| poor\_health | % of adults with poor health for >= 14 of the last 30 days | county health |
| days\_pr\_hlth | days of poor health for >= 14 of the last 30 days | county health |
| days\_pr\_mntl | days of poor mental health for >= 14 of the last 30 days | county health |
| low\_birthwt | % of live births with low birthweight | county health |
| csmoking | % of adults who are current smokers | county health |
| obesity | % of adults who are obese | county health |
| food\_ndx | Food environment index | county health |
| lpa | % of adults with no leisure physical activity in the last month | county health |
| exercise\_place | Access to exercise opportunities | county health |
| binge | % of adults "binge" drinking in the last 30 days | county health |
| dui | # alcohol-impaired driving deaths | county health |
| stds | Chlamydia cases per 100 000 | county health |
| teen\_births | Teen birth rate | county health |
| access2 | % adult uninsured | county health |
| physicians | Primary care physicians per 100 000 | county health |
| dentists | Dentists per 100 000 | county health |
| shrinks | Mental health providers per 100 000 | county health |
| wrong\_hosp | Preventable hospital stay rate | county health |
| diabetic\_scrn | % of diabetics with testing | county health |
| mammography | % of women 40-75 who have had a mammogram in the last 2 years | county health |
| high\_school | % of adults with high-school diploma | county health |
| college | % of adults with some college | county health |
| child\_pov | # of children in poverty | county health |
| inequality | Income inequality | county health |
| child\_sngl\_prnt | # of children in single-parent households | county health |
| social | social associations | county health |
| violent | # of violent crimes | county health |
| injury\_dths | # of injury deaths | county health |
| pm10 | air pollution | county health |
| house\_probs | severe housing problems | county health |
| drive\_alone | % of commuters who drive alone to work | county health |
| long\_commute | % of commuters with a long commute driving alone | county health |
| early\_mortality | Premature age-adjsted mortality | county health |
| child\_mortality | Child mortality rate | county health |
| infant\_death | Infant mortality rate | county health |
| phys\_distress | % frequent physical distress | county health |
| mntl\_distress | % frequent mental distress | county health |
| diabetes | diabetes prevalence | county health |
| hiv | HIV prevalence | county health |
| food\_insecurity | % Food insecurity | county health |
| no\_healthy\_food | % with limited access to healthy foods | county health |
| drug\_overdose | Drug overdose death rate | county health |
| mv\_deaths | Moter vehicle accident death rate | county health |
| lack\_sleep | % insufficent sleep | county health |
| uninsured\_adult | % adults uninsured | county health |
| uninsured\_child | % children uninsured | county health |
| hlth\_cost | Health care costs | county health |
| nurses | Other primary care provider rate | county health |
| free\_lunch | Children eligible for free lunch | county health |
| segregation1 | black/while segregation | county health |
| segregation2 | white/non-white segregation | county health |
| homicide | Homicides | county health |
| rural | % rural | county health |

# Appendix B: Low- Hazard Properties: Model Results

Table 11: Root Mean Square (RMS) Errors of models of fire risk for low hazard properties.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Small Filter** | | **Mean** | **MSE** | | |
| **Model Run** | **Predictors** | **Floor** | **Outlier** | **Separate** | **Dummies** | |
| Constant |  | 25 | X | 2.1228 |  | | 2.9559 |
| dept.effect |  | 25 | X | 2.1228 |  | | 2.8447 |
| tract |  |  |  | 2.1228 |  | | 2.5570 |
| lasso.min | time, base, race, age, house, personal, fuel | 25 | X | 2.1228 |  | | 2.6180 |
| lasso.1se | time, base, race, age, house, personal, fuel | 25 | X | 2.1228 |  | | 2.6526 |
| rForest | time, base, race, age, house, personal, fuel | 25 | X | 2.1228 |  | | **2.3859** |
| base | time, base, race, age, house, personal, fuel | 25 | X | 2.1228 | 2.6641 | 2.6191 | |
| M101111 | time, base, age, house, personal, fuel | 25 | X | 2.1228 | 2.6383 | 2.6244 | |
| M100111 | time, base, house, personal, fuel | 25 | X | 2.1228 | 2.6046 | 2.6176 | |
| M101011 | time, base, age, personal, fuel | 25 | X | 2.1228 | 2.7534 | 2.7888 | |
| M101101 | time, base, age, house, fuel | 25 | X | 2.1228 | 2.6115 | 2.6290 | |
| M101110 | time, base, age, house, personal | 25 | X | 2.1228 | 2.6392 | 2.6186 | |
| M110111 | time, base, race, house, personal, fuel | 25 | X | 2.1228 | 2.6322 | 2.6271 | |
| M110011 | time, base, race, personal, fuel | 25 | X | 2.1228 | 2.7421 | 2.7856 | |
| M110101 | time, base, race, house, fuel | 25 | X | 2.1228 | 2.6474 | 2.6435 | |
| M110110 | time, base, race, house, personal | 25 | X | 2.1228 | 2.6353 | 2.6189 | |
| M111011 | time, base, race, age, personal, fuel | 25 | X | 2.1228 | 2.7735 | 2.7504 | |
| M111001 | time, base, race, age, fuel | 25 | X | 2.1228 | 2.8366 | 2.8048 | |
| M111010 | time, base, race, age, personal | 25 | X | 2.1228 | 2.7798 | 2.7541 | |
| M111101 | time, base, race, age, house, fuel | 25 | X | 2.1228 | 2.6579 | 2.6322 | |
| M111100 | time, base, race, age, house | 25 | X | 2.1228 | 2.6626 | 2.6242 | |
| M111110 | time, base, race, age, house, personal | 25 | X | 2.1228 | 2.6635 | 2.6130 | |
| f.050 | time, base, house, personal, fuel | 50 | X | 2.1228 | 2.6055 |  | |
| f.100 | time, base, house, personal, fuel | 100 | X | 2.1228 | 2.6060 |  | |
| f.150 | time, base, house, personal, fuel | 150 | X | 2.1228 | 2.6083 |  | |
| f.200 | time, base, house, personal, fuel | 200 | X | 2.1228 | 2.6119 |  | |
| f.250 | time, base, house, personal, fuel | 250 | X | 2.1228 | 2.6260 |  | |
| f.500 | time, base, house, personal, fuel | 500 | X | 2.1228 | 2.6378 |  | |
| f.000 | time, base, house, personal, fuel | 1000 | X | 2.1228 | 2.9886 |  | |

Table 12: RMS Errors of models of percent of fires that grow beyond the room of origin for low hazard properties.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **Small Filter** | | **Mean (%)** | **MSE** | |
| **Model Run** | **Predictors** | **Floor** | **Outlier** | **Separate** | **Dummies** |
| Constant |  | 25 | X | 0.4247 | 0.4132 | |
| dept.effect |  | 25 | X | 0.4247 | 0.3909 | |
| tract |  |  |  | 0.4247 | 0.5095 | |
| base | time, base, race, age, house, personal, fuel | 25 | X | 0.4247 | 0.3901 | **0.3895** |
| M101111 | time, base, age, house, personal, fuel | 25 | X | 0.4247 | 0.3908 | 0.3896 |
| M100111 | time, base, house, personal, fuel | 25 | X | 0.4247 | 0.3901 | 0.3895 |
| M101011 | time, base, age, personal, fuel | 25 | X | 0.4247 | 0.3910 | 0.3899 |
| M101101 | time, base, age, house, fuel | 25 | X | 0.4247 | 0.3909 | 0.3898 |
| M101110 | time, base, age, house, personal | 25 | X | 0.4247 | 0.3908 | 0.3897 |
| M110111 | time, base, race, house, personal, fuel | 25 | X | 0.4247 | 0.3901 | 0.3895 |
| M110011 | time, base, race, personal, fuel | 25 | X | 0.4247 | 0.3903 | 0.3900 |
| M110101 | time, base, race, house, fuel | 25 | X | 0.4247 | 0.3901 | 0.3897 |
| M110110 | time, base, race, house, personal | 25 | X | 0.4247 | 0.3901 | 0.3896 |
| M111011 | time, base, race, age, personal, fuel | 25 | X | 0.4247 | 0.3910 | 0.3899 |
| M111001 | time, base, race, age, fuel | 25 | X | 0.4247 | 0.3911 | 0.3903 |
| M111010 | time, base, race, age, personal | 25 | X | 0.4247 | 0.3911 | 0.3902 |
| M111101 | time, base, race, age, house, fuel | 25 | X | 0.4247 | 0.3909 | 0.3898 |
| M111100 | time, base, race, age, house | 25 | X | 0.4247 | 0.3909 | 0.3899 |
| M111110 | time, base, race, age, house, personal | 25 | X | 0.4247 | 0.3909 | 0.3896 |

Table 13: RMS Errors of models of percent of fires that grow beyond the structure of origin for low hazard properties.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **Small Filter** | | **Mean (%)** | **MSE** | |
| **Model Run** | **Predictors** | **Floor** | **Outlier** | **Separate** | **Dummies** |
| Constant |  | 25 | X | 0.1082 | 0.2710 | |
| dept.effect |  | 25 | X | 0.1082 | 0.2704 | |
| tract |  |  |  | 0.1082 | 0.3487 | |
| base | time, base, race, age, house, personal, fuel | 25 | X | 0.1082 | 0.2708 | **0.2697** |
| M101111 | time, base, age, house, personal, fuel | 25 | X | 0.1082 | 0.2722 | 0.2698 |
| M100111 | time, base, house, personal, fuel | 25 | X | 0.1082 | 0.2708 | 0.2697 |
| M101011 | time, base, age, personal, fuel | 25 | X | 0.1082 | 0.2717 | 0.2699 |
| M101101 | time, base, age, house, fuel | 25 | X | 0.1082 | 0.2716 | 0.2697 |
| M101110 | time, base, age, house, personal | 25 | X | 0.1082 | 0.2722 | 0.2702 |
| M110111 | time, base, race, house, personal, fuel | 25 | X | 0.1082 | 0.2706 | 0.2698 |
| M110011 | time, base, race, personal, fuel | 25 | X | 0.1082 | 0.2702 | 0.2699 |
| M110101 | time, base, race, house, fuel | 25 | X | 0.1082 | 0.2705 | 0.2698 |
| M110110 | time, base, race, house, personal | 25 | X | 0.1082 | 0.2708 | 0.2703 |
| M111011 | time, base, race, age, personal, fuel | 25 | X | 0.1082 | 0.2715 | 0.2699 |
| M111001 | time, base, race, age, fuel | 25 | X | 0.1082 | 0.2710 | 0.2700 |
| M111010 | time, base, race, age, personal | 25 | X | 0.1082 | 0.2715 | 0.2705 |
| M111101 | time, base, race, age, house, fuel | 25 | X | 0.1082 | 0.2715 | 0.2699 |
| M111100 | time, base, race, age, house | 25 | X | 0.1082 | 0.2715 | 0.2703 |
| M111110 | time, base, race, age, house, personal | 25 | X | 0.1082 | 0.2719 | 0.2703 |

Table 14: RMS Errors of models of fire injury for low hazard properties.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **Small Filter** | | **Mean** | **MSE** | |
| **Model Run** | **Predictors** | **Floor** | **Outlier** | **Separate** | **Dummies** |
| Constant |  | 25 | X | 0.1805 | 0.6442 | |
| dept.effect |  | 25 | X | 0.1805 | 0.6331 | |
| tract |  |  |  | 0.1805 | 0.8746 | |
| lasso.min | time, base, race, age, house, personal, fuel | 25 | X | 0.1805 | 0.6327 | |
| lasso.1se | time, base, race, age, house, personal, fuel | 25 | X | 0.1805 | 0.6340 | |
| rForest | time, base, race, age, house, personal, fuel | 25 | X | 0.1805 | 0.6402 | |
| base | time, base, race, age, house, personal, fuel | 25 | X | 0.1805 | 0.6448 | 0.6263 |
| M101111 | time, base, age, house, personal, fuel | 25 | X | 0.1805 | 0.6479 | 0.6257 |
| M100111 | time, base, house, personal, fuel | 25 | X | 0.1805 | 0.6448 | 0.6263 |
| M101011 | time, base, age, personal, fuel | 25 | X | 0.1805 | 0.6333 | 0.6260 |
| M101101 | time, base, age, house, fuel | 25 | X | 0.1805 | 0.6469 | 0.6273 |
| M101110 | time, base, age, house, personal | 25 | X | 0.1805 | 0.6449 | 0.6258 |
| M110111 | time, base, race, house, personal, fuel | 25 | X | 0.1805 | 0.6478 | 0.6264 |
| M110011 | time, base, race, personal, fuel | 25 | X | 0.1805 | 0.6313 | 0.6275 |
| M110101 | time, base, race, house, fuel | 25 | X | 0.1805 | 0.6478 | 0.6281 |
| M110110 | time, base, race, house, personal | 25 | X | 0.1805 | 0.6415 | 0.6264 |
| M111011 | time, base, race, age, personal, fuel | 25 | X | 0.1805 | 0.6395 | 0.6260 |
| M111001 | time, base, race, age, fuel | 25 | X | 0.1805 | 0.6411 | 0.6313 |
| M111010 | time, base, race, age, personal | 25 | X | 0.1805 | 0.6361 | 0.6261 |
| M111101 | time, base, race, age, house, fuel | 25 | X | 0.1805 | 0.6505 | 0.6276 |
| M111100 | time, base, race, age, house | 25 | X | 0.1805 | 0.6469 | 0.6275 |
| M111110 | time, base, race, age, house, personal | 25 | X | 0.1805 | 0.6475 | **0.6254** |

Table 15: RMS Errors of models of fire deaths for low hazard properties.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **Small Filter** | | **Mean** | **MSE** | |
| **Model Run** | **Predictors** | **Floor** | **Outlier** | **Separate** | **Dummies** |
| Constant |  | 25 | X | 0.0184 | 0.1772 | |
| dept.effect |  | 25 | X | 0.0184 | 0.1772 | |
| tract |  |  |  | 0.0184 | 0.2538 | |
| lasso.min | time, base, race, age, house, personal, fuel | 25 | X | 0.0184 | **0.1768** | |
| lasso.1se | time, base, race, age, house, personal, fuel | 25 | X | 0.0184 | 0.1770 | |
| rForest | time, base, race, age, house, personal, fuel | 25 | X | 0.0184 | 0.1789 | |
| base | time, base, race, age, house, personal, fuel | 25 | X | 0.0184 | 5.3604 | 0.1769 |
| M101111 | time, base, age, house, personal, fuel | 25 | X | 0.0184 | 6.3266 | **0.1769** |
| M100111 | time, base, house, personal, fuel | 25 | X | 0.0184 | 5.3604 | 0.1769 |
| M101011 | time, base, age, personal, fuel | 25 | X | 0.0184 | 0.1793 | 0.1769 |
| M101101 | time, base, age, house, fuel | 25 | X | 0.0184 | 2.5591 | 0.1769 |
| M101110 | time, base, age, house, personal | 25 | X | 0.0184 | 4.0317 | 0.1769 |
| M110111 | time, base, race, house, personal, fuel | 25 | X | 0.0184 | 7.0284 | 0.1769 |
| M110011 | time, base, race, personal, fuel | 25 | X | 0.0184 | 0.1778 | 0.1770 |
| M110101 | time, base, race, house, fuel | 25 | X | 0.0184 | 2.9679 | 0.1769 |
| M110110 | time, base, race, house, personal | 25 | X | 0.0184 | 2.9177 | 0.1769 |
| M111011 | time, base, race, age, personal, fuel | 25 | X | 0.0184 | 0.1794 | 0.1769 |
| M111001 | time, base, race, age, fuel | 25 | X | 0.0184 | 0.1784 | 0.1770 |
| M111010 | time, base, race, age, personal | 25 | X | 0.0184 | 0.1780 | 0.1770 |
| M111101 | time, base, race, age, house, fuel | 25 | X | 0.0184 | 3.5768 | 0.1769 |
| M111100 | time, base, race, age, house | 25 | X | 0.0184 | 2.2835 | 0.1769 |
| M111110 | time, base, race, age, house, personal | 25 | X | 0.0184 | 5.5102 | 0.1769 |

# Appendix C: Medium- Hazard Properties: Model Results

Table 16: RMS Errors of models of fire risk for medium hazard properties.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

|  |  | **Mean** | **RMSE** | |
| --- | --- | --- | --- | --- |
| **Model Run** | **Predictors** | **Separate** | **Dummies** |
| constant |  | 1.96 | 4.2898 | |
| fx |  | 1.96 | 3.8521 | |
| tract |  | 1.96 | 2.9349 | |
| lasso.min | time, base, race, age, house, personal | 1.96 | 5.4329 | |
| lasso.1se | time, base, race, age, house, personal | 1.96 | 5.1042 | |
| rf.0500 | time, base, race, age, house, personal | 1.96 | **2.9066** | |
| rf.2500 | time, base, race, age, house, personal | 1.96 | **2.9066** | |
| mr.100000 | time | 1.96 | 3.8528 | 3.8550 |
| mr.010000 | base | 1.96 | 6.0926 | 4.0019 |
| mr.110000 | time, base | 1.96 | 6.0855 | 4.0033 |
| mr.001000 | race | 1.96 | 9.1421 | 7.4384 |
| mr.101000 | time, race | 1.96 | 9.1411 | 7.4365 |
| mr.011000 | base, race | 1.96 | 14.0619 | 18.1033 |
| mr.111000 | time, base, race | 1.96 | 14.0684 | 18.0627 |
| mr.000100 | age | 1.96 | 3.5807 | 3.6102 |
| mr.100100 | time, age | 1.96 | 3.5794 | 3.6134 |
| mr.010100 | base, age | 1.96 | 4.0325 | 8.3532 |
| mr.110100 | time, base, age | 1.96 | 4.0801 | 8.7797 |
| mr.001100 | race, age | 1.96 | 4.9517 | 6.2661 |
| mr.101100 | time, race, age | 1.96 | 4.9333 | 6.2540 |
| mr.011100 | base, race, age | 1.96 | 4.8144 | 13.8594 |
| mr.111100 | time, base, race, age | 1.96 | 4.7710 | 14.3395 |
| mr.000010 | house | 1.96 | 3.6017 | 4.1742 |
| mr.100010 | time, house | 1.96 | 3.6040 | 4.1763 |
| mr.010010 | base, house | 1.96 | 3.5931 | 4.3357 |
| mr.110010 | time, base, house | 1.96 | 3.5861 | 4.3348 |
| mr.001010 | race, house | 1.96 | 4.5524 | 5.4363 |
| mr.101010 | time, race, house | 1.96 | 4.5539 | 5.4312 |
| mr.011010 | base, race, house | 1.96 | 4.5188 | 5.9286 |
| mr.111010 | time, base, race, house | 1.96 | 4.5158 | 5.9245 |
| mr.000110 | age, house | 1.96 | 3.6150 | 4.1887 |
| mr.100110 | time, age, house | 1.96 | 3.6181 | 4.1992 |
| mr.010110 | base, age, house | 1.96 | 3.6307 | 3.8707 |
| mr.110110 | time, base, age, house | 1.96 | 3.6364 | 3.8759 |
| mr.001110 | race, age, house | 1.96 | 3.7425 | 4.4266 |
| mr.101110 | time, race, age, house | 1.96 | 3.7372 | 4.4276 |
| mr.011110 | base, race, age, house | 1.96 | 4.4387 | 5.2162 |
| mr.111110 | time, base, race, age, house | 1.96 | 4.4181 | 5.1980 |
| mr.000001 | personal | 1.96 | 5.3904 | 4.3304 |
| mr.100001 | time, personal | 1.96 | 5.3992 | 4.3367 |
| mr.010001 | base, personal | 1.96 | 3.9126 | 4.7478 |
| mr.110001 | time, base, personal | 1.96 | 3.9665 | 4.7706 |
| mr.001001 | race, personal | 1.96 | 7.5266 | 5.6002 |
| mr.101001 | time, race, personal | 1.96 | 7.5237 | 5.6153 |
| mr.011001 | base, race, personal | 1.96 | 4.3830 | 6.1931 |
| mr.111001 | time, base, race, personal | 1.96 | 4.4337 | 6.2262 |
| mr.000101 | age, personal | 1.96 | 3.9020 | 5.0191 |
| mr.100101 | time, age, personal | 1.96 | 3.8976 | 5.0339 |
| mr.010101 | base, age, personal | 1.96 | 3.7502 | 4.1935 |
| mr.110101 | time, base, age, personal | 1.96 | 3.7622 | 4.1918 |
| mr.001101 | race, age, personal | 1.96 | 4.2938 | 5.9742 |
| mr.101101 | time, race, age, personal | 1.96 | 4.2904 | 5.9802 |
| mr.011101 | base, race, age, personal | 1.96 | 4.1424 | 5.4903 |
| mr.111101 | time, base, race, age, personal | 1.96 | 4.1526 | 5.4922 |
| mr.000011 | house, personal | 1.96 | 3.4203 | 5.0597 |
| mr.100011 | time, house, personal | 1.96 | 3.4223 | 5.0871 |
| mr.010011 | base, house, personal | 1.96 | 3.7852 | 5.4390 |
| mr.110011 | time, base, house, personal | 1.96 | 3.7756 | 5.4675 |
| mr.001011 | race, house, personal | 1.96 | 4.0709 | 6.5501 |
| mr.101011 | time, race, house, personal | 1.96 | 4.0924 | 6.5815 |
| mr.011011 | base, race, house, personal | 1.96 | 4.8339 | 7.7235 |
| mr.111011 | time, base, race, house, personal | 1.96 | 4.8298 | 7.7502 |
| mr.000111 | age, house, personal | 1.96 | 3.6996 | 5.0109 |
| mr.100111 | time, age, house, personal | 1.96 | 3.6901 | 5.0014 |
| mr.010111 | base, age, house, personal | 1.96 | 4.1191 | 5.4157 |
| mr.110111 | time, base, age, house, personal | 1.96 | 4.1015 | 5.3867 |
| mr.001111 | race, age, house, personal | 1.96 | 4.1740 | 5.5691 |
| mr.101111 | time, race, age, house, personal | 1.96 | 4.1772 | 5.5584 |
| mr.011111 | base, race, age, house, personal | 1.96 | 4.9311 | 6.8501 |
| mr.base | time, base, race, age, house, personal | 1.96 | 4.9303 | 6.8467 |

Table 17: RMS Errors of models of percent of fires that grow beyond the room of origin for medium hazard properties.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

|  |  | **Mean (%)** | **RMSE** | |
| --- | --- | --- | --- | --- |
| **Model Run** | **Predictors** | **Separate** | **Dummies** |
| constant |  | 0.3653 | 0.4275 | |
| fx |  | 0.3653 | 0.4051 | |
| tract |  | 0.3653 | 0.5279 | |
| mr.100000 | time | 0.3653 | 0.4103 | 0.4100 |
| mr.010000 | base | 0.3653 | 0.4089 | 0.4088 |
| mr.110000 | time, base | 0.3653 | 0.4094 | 0.4090 |
| mr.001000 | race | 0.3653 | 0.4095 | 0.4096 |
| mr.101000 | time, race | 0.3653 | 0.4099 | 0.4098 |
| mr.011000 | base, race | 0.3653 | 0.4084 | 0.4086 |
| mr.111000 | time, base, race | 0.3653 | 0.4089 | 0.4088 |
| mr.000100 | age | 0.3653 | 0.4090 | 0.4086 |
| mr.100100 | time, age | 0.3653 | 0.4093 | 0.4087 |
| mr.010100 | base, age | 0.3653 | 0.4085 | 0.4081 |
| mr.110100 | time, base, age | 0.3653 | 0.4089 | 0.4083 |
| mr.001100 | race, age | 0.3653 | 0.4086 | 0.4084 |
| mr.101100 | time, race, age | 0.3653 | 0.4090 | 0.4086 |
| mr.011100 | base, race, age | 0.3653 | 0.4082 | 0.4080 |
| mr.111100 | time, base, race, age | 0.3653 | 0.4085 | 0.4082 |
| mr.000010 | house | 0.3653 | 0.4066 | 0.4066 |
| mr.100010 | time, house | 0.3653 | 0.4069 | 0.4067 |
| mr.010010 | base, house | 0.3653 | 0.4065 | 0.4065 |
| mr.110010 | time, base, house | 0.3653 | 0.4068 | 0.4067 |
| mr.001010 | race, house | 0.3653 | 0.4064 | 0.4065 |
| mr.101010 | time, race, house | 0.3653 | 0.4067 | 0.4067 |
| mr.011010 | base, race, house | 0.3653 | **0.4064** | 0.4064 |
| mr.111010 | time, base, race, house | 0.3653 | 0.4067 | 0.4066 |
| mr.000110 | age, house | 0.3653 | 0.4072 | 0.4066 |
| mr.100110 | time, age, house | 0.3653 | 0.4075 | 0.4068 |
| mr.010110 | base, age, house | 0.3653 | 0.4070 | 0.4065 |
| mr.110110 | time, base, age, house | 0.3653 | 0.4073 | 0.4066 |
| mr.001110 | race, age, house | 0.3653 | 0.4070 | 0.4066 |
| mr.101110 | time, race, age, house | 0.3653 | 0.4073 | 0.4067 |
| mr.011110 | base, race, age, house | 0.3653 | 0.4068 | **0.4064** |
| mr.111110 | time, base, race, age, house | 0.3653 | 0.4072 | 0.4066 |
| mr.000001 | personal | 0.3653 | 0.4097 | 0.4098 |
| mr.100001 | time, personal | 0.3653 | 0.4102 | 0.4100 |
| mr.010001 | base, personal | 0.3653 | 0.4086 | 0.4084 |
| mr.110001 | time, base, personal | 0.3653 | 0.4090 | 0.4086 |
| mr.001001 | race, personal | 0.3653 | 0.4093 | 0.4096 |
| mr.101001 | time, race, personal | 0.3653 | 0.4097 | 0.4098 |
| mr.011001 | base, race, personal | 0.3653 | 0.4083 | 0.4082 |
| mr.111001 | time, base, race, personal | 0.3653 | 0.4087 | 0.4084 |
| mr.000101 | age, personal | 0.3653 | 0.4090 | 0.4085 |
| mr.100101 | time, age, personal | 0.3653 | 0.4093 | 0.4087 |
| mr.010101 | base, age, personal | 0.3653 | 0.4085 | 0.4081 |
| mr.110101 | time, base, age, personal | 0.3653 | 0.4089 | 0.4083 |
| mr.001101 | race, age, personal | 0.3653 | 0.4087 | 0.4084 |
| mr.101101 | time, race, age, personal | 0.3653 | 0.4091 | 0.4085 |
| mr.011101 | base, race, age, personal | 0.3653 | 0.4084 | 0.4079 |
| mr.111101 | time, base, race, age, personal | 0.3653 | 0.4088 | 0.4081 |
| mr.000011 | house, personal | 0.3653 | 0.4069 | 0.4067 |
| mr.100011 | time, house, personal | 0.3653 | 0.4073 | 0.4069 |
| mr.010011 | base, house, personal | 0.3653 | 0.4068 | 0.4065 |
| mr.110011 | time, base, house, personal | 0.3653 | 0.4071 | 0.4067 |
| mr.001011 | race, house, personal | 0.3653 | 0.4069 | 0.4067 |
| mr.101011 | time, race, house, personal | 0.3653 | 0.4072 | 0.4069 |
| mr.011011 | base, race, house, personal | 0.3653 | 0.4068 | 0.4065 |
| mr.111011 | time, base, race, house, personal | 0.3653 | 0.4072 | 0.4067 |
| mr.000111 | age, house, personal | 0.3653 | 0.4075 | 0.4066 |
| mr.100111 | time, age, house, personal | 0.3653 | 0.4078 | 0.4068 |
| mr.010111 | base, age, house, personal | 0.3653 | 0.4072 | 0.4065 |
| mr.110111 | time, base, age, house, personal | 0.3653 | 0.4076 | 0.4067 |
| mr.001111 | race, age, house, personal | 0.3653 | 0.4074 | 0.4066 |
| mr.101111 | time, race, age, house, personal | 0.3653 | 0.4077 | 0.4068 |
| mr.011111 | base, race, age, house, personal | 0.3653 | 0.4073 | 0.4065 |
| mr.base | time, base, race, age, house, personal | 0.3653 | 0.4076 | 0.4066 |

Table 18: RMS Errors of models of percent of fires that grow beyond the structure of origin for medium hazard properties.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

|  |  | **Mean (%)** | **RMSE** | |
| --- | --- | --- | --- | --- |
| **Model Run** | **Predictors** | **Separate** | **Dummies** |
| constant |  | 0.1229 | 0.3054 | |
| fx |  | 0.1229 | 0.3020 | |
| tract |  | 0.1229 | 0.3821 | |
| mr.100000 | time | 0.1229 | **0.3043** | 0.3040 |
| mr.010000 | base | 0.1229 | 0.3046 | 0.3037 |
| mr.110000 | time, base | 0.1229 | 0.3046 | 0.3036 |
| mr.001000 | race | 0.1229 | 0.3047 | 0.3041 |
| mr.101000 | time, race | 0.1229 | 0.3048 | 0.3041 |
| mr.011000 | base, race | 0.1229 | 0.3049 | 0.3037 |
| mr.111000 | time, base, race | 0.1229 | 0.3049 | 0.3036 |
| mr.000100 | age | 0.1229 | 0.3060 | 0.3033 |
| mr.100100 | time, age | 0.1229 | 0.3061 | 0.3033 |
| mr.010100 | base, age | 0.1229 | 0.3065 | 0.3032 |
| mr.110100 | time, base, age | 0.1229 | 0.3066 | 0.3031 |
| mr.001100 | race, age | 0.1229 | 0.3059 | 0.3033 |
| mr.101100 | time, race, age | 0.1229 | 0.3061 | 0.3033 |
| mr.011100 | base, race, age | 0.1229 | 0.3068 | 0.3032 |
| mr.111100 | time, base, race, age | 0.1229 | 0.3070 | 0.3031 |
| mr.000010 | house | 0.1229 | 0.3044 | 0.3022 |
| mr.100010 | time, house | 0.1229 | 0.3045 | 0.3021 |
| mr.010010 | base, house | 0.1229 | 0.3052 | 0.3021 |
| mr.110010 | time, base, house | 0.1229 | 0.3053 | 0.3021 |
| mr.001010 | race, house | 0.1229 | 0.3050 | 0.3021 |
| mr.101010 | time, race, house | 0.1229 | 0.3050 | 0.3021 |
| mr.011010 | base, race, house | 0.1229 | 0.3054 | 0.3022 |
| mr.111010 | time, base, race, house | 0.1229 | 0.3055 | 0.3021 |
| mr.000110 | age, house | 0.1229 | 0.3071 | 0.3021 |
| mr.100110 | time, age, house | 0.1229 | 0.3073 | 0.3020 |
| mr.010110 | base, age, house | 0.1229 | 0.3074 | 0.3021 |
| mr.110110 | time, base, age, house | 0.1229 | 0.3077 | 0.3020 |
| mr.001110 | race, age, house | 0.1229 | 0.3071 | 0.3020 |
| mr.101110 | time, race, age, house | 0.1229 | 0.3073 | **0.3020** |
| mr.011110 | base, race, age, house | 0.1229 | 0.3075 | 0.3021 |
| mr.111110 | time, base, race, age, house | 0.1229 | 0.3079 | 0.3020 |
| mr.000001 | personal | 0.1229 | 0.3048 | 0.3037 |
| mr.100001 | time, personal | 0.1229 | 0.3048 | 0.3036 |
| mr.010001 | base, personal | 0.1229 | 0.3054 | 0.3031 |
| mr.110001 | time, base, personal | 0.1229 | 0.3054 | 0.3031 |
| mr.001001 | race, personal | 0.1229 | 0.3051 | 0.3036 |
| mr.101001 | time, race, personal | 0.1229 | 0.3051 | 0.3036 |
| mr.011001 | base, race, personal | 0.1229 | 0.3054 | 0.3031 |
| mr.111001 | time, base, race, personal | 0.1229 | 0.3054 | 0.3030 |
| mr.000101 | age, personal | 0.1229 | 0.3074 | 0.3031 |
| mr.100101 | time, age, personal | 0.1229 | 0.3075 | 0.3031 |
| mr.010101 | base, age, personal | 0.1229 | 0.3079 | 0.3029 |
| mr.110101 | time, base, age, personal | 0.1229 | 0.3081 | 0.3029 |
| mr.001101 | race, age, personal | 0.1229 | 0.3074 | 0.3031 |
| mr.101101 | time, race, age, personal | 0.1229 | 0.3076 | 0.3031 |
| mr.011101 | base, race, age, personal | 0.1229 | 0.3081 | 0.3029 |
| mr.111101 | time, base, race, age, personal | 0.1229 | 0.3084 | 0.3029 |
| mr.000011 | house, personal | 0.1229 | 0.3060 | 0.3023 |
| mr.100011 | time, house, personal | 0.1229 | 0.3061 | 0.3022 |
| mr.010011 | base, house, personal | 0.1229 | 0.3065 | 0.3023 |
| mr.110011 | time, base, house, personal | 0.1229 | 0.3066 | 0.3022 |
| mr.001011 | race, house, personal | 0.1229 | 0.3063 | 0.3023 |
| mr.101011 | time, race, house, personal | 0.1229 | 0.3063 | 0.3022 |
| mr.011011 | base, race, house, personal | 0.1229 | 0.3068 | 0.3022 |
| mr.111011 | time, base, race, house, personal | 0.1229 | 0.3069 | 0.3022 |
| mr.000111 | age, house, personal | 0.1229 | 0.3088 | 0.3021 |
| mr.100111 | time, age, house, personal | 0.1229 | 0.3090 | 0.3021 |
| mr.010111 | base, age, house, personal | 0.1229 | 0.3091 | 0.3021 |
| mr.110111 | time, base, age, house, personal | 0.1229 | 0.3094 | 0.3021 |
| mr.001111 | race, age, house, personal | 0.1229 | 0.3092 | 0.3021 |
| mr.101111 | time, race, age, house, personal | 0.1229 | 0.3094 | 0.3021 |
| mr.011111 | base, race, age, house, personal | 0.1229 | 0.3095 | 0.3021 |
| mr.base | time, base, race, age, house, personal | 0.1229 | 0.3098 | 0.3021 |

Table 19: RMS Errors of models of fire injury for medium hazard properties.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

|  |  | **Mean** | **RMSE** | |
| --- | --- | --- | --- | --- |
| **Model Run** | **Predictors** | **Separate** | **Dummies** |
| constant |  | 0.0628 | 0.3786 | |
| fx |  | 0.0628 | 0.3777 | |
| tract |  | 0.0628 | 0.5490 | |
| lasso.min | time, base, race, age, house, personal | 0.0628 | 0.3830 | |
| lasso.1se | time, base, race, age, house, personal | 0.0628 | 0.3791 | |
| rf.0500 | time, base, race, age, house, personal | 0.0628 | 0.3816 | |
| rf.2500 | time, base, race, age, house, personal | 0.0628 | 0.3812 | |
| mr.100000 | time | 0.0628 | 0.3780 | 0.3776 |
| mr.010000 | base | 0.0628 | 0.3814 | 0.3784 |
| mr.110000 | time, base | 0.0628 | 0.3816 | 0.3784 |
| mr.001000 | race | 0.0628 | 0.3874 | 0.3925 |
| mr.101000 | time, race | 0.0628 | 0.3875 | 0.3925 |
| mr.011000 | base, race | 0.0628 | 0.3962 | 0.4781 |
| mr.111000 | time, base, race | 0.0628 | 0.3953 | 0.4781 |
| mr.000100 | age | 0.0628 | 0.3773 | 0.3779 |
| mr.100100 | time, age | 0.0628 | 0.3775 | 0.3779 |
| mr.010100 | base, age | 0.0628 | 0.3813 | 0.3918 |
| mr.110100 | time, base, age | 0.0628 | 0.3814 | 0.3928 |
| mr.001100 | race, age | 0.0628 | 0.3769 | 0.3891 |
| mr.101100 | time, race, age | 0.0628 | 0.3768 | 0.3894 |
| mr.011100 | base, race, age | 0.0628 | 0.3814 | 0.4078 |
| mr.111100 | time, base, race, age | 0.0628 | 0.3811 | 0.4085 |
| mr.000010 | house | 0.0628 | 0.5522 | 0.3788 |
| mr.100010 | time, house | 0.0628 | 0.5541 | 0.3787 |
| mr.010010 | base, house | 0.0628 | 0.5733 | 0.3788 |
| mr.110010 | time, base, house | 0.0628 | 0.5775 | 0.3787 |
| mr.001010 | race, house | 0.0628 | 1.1627 | 0.3799 |
| mr.101010 | time, race, house | 0.0628 | 1.1654 | 0.3797 |
| mr.011010 | base, race, house | 0.0628 | 0.9225 | 0.3815 |
| mr.111010 | time, base, race, house | 0.0628 | 0.9254 | 0.3814 |
| mr.000110 | age, house | 0.0628 | 0.7159 | 0.3795 |
| mr.100110 | time, age, house | 0.0628 | 0.7155 | 0.3793 |
| mr.010110 | base, age, house | 0.0628 | 0.7082 | 0.3785 |
| mr.110110 | time, base, age, house | 0.0628 | 0.7082 | 0.3785 |
| mr.001110 | race, age, house | 0.0628 | 0.7995 | 0.3820 |
| mr.101110 | time, race, age, house | 0.0628 | 0.8011 | 0.3818 |
| mr.011110 | base, race, age, house | 0.0628 | 0.8089 | 0.3830 |
| mr.111110 | time, base, race, age, house | 0.0628 | 0.8087 | 0.3830 |
| mr.000001 | personal | 0.0628 | 0.3784 | **0.3761** |
| mr.100001 | time, personal | 0.0628 | 0.3790 | 0.3761 |
| mr.010001 | base, personal | 0.0628 | 0.3846 | 0.3778 |
| mr.110001 | time, base, personal | 0.0628 | 0.3847 | 0.3778 |
| mr.001001 | race, personal | 0.0628 | 0.3815 | 0.3788 |
| mr.101001 | time, race, personal | 0.0628 | 0.3823 | 0.3788 |
| mr.011001 | base, race, personal | 0.0628 | 0.3970 | 0.3825 |
| mr.111001 | time, base, race, personal | 0.0628 | 0.3982 | 0.3825 |
| mr.000101 | age, personal | 0.0628 | **0.3754** | 0.3820 |
| mr.100101 | time, age, personal | 0.0628 | 0.3755 | 0.3823 |
| mr.010101 | base, age, personal | 0.0628 | 0.3805 | 0.3775 |
| mr.110101 | time, base, age, personal | 0.0628 | 0.3806 | 0.3775 |
| mr.001101 | race, age, personal | 0.0628 | 0.3757 | 0.3824 |
| mr.101101 | time, race, age, personal | 0.0628 | 0.3758 | 0.3826 |
| mr.011101 | base, race, age, personal | 0.0628 | 0.3857 | 0.3800 |
| mr.111101 | time, base, race, age, personal | 0.0628 | 0.3861 | 0.3800 |
| mr.000011 | house, personal | 0.0628 | 0.9446 | 0.3786 |
| mr.100011 | time, house, personal | 0.0628 | 0.9890 | 0.3786 |
| mr.010011 | base, house, personal | 0.0628 | 0.8528 | 0.3793 |
| mr.110011 | time, base, house, personal | 0.0628 | 0.9016 | 0.3793 |
| mr.001011 | race, house, personal | 0.0628 | 2.6674 | 0.3825 |
| mr.101011 | time, race, house, personal | 0.0628 | 2.8300 | 0.3825 |
| mr.011011 | base, race, house, personal | 0.0628 | 2.1459 | 0.3850 |
| mr.111011 | time, base, race, house, personal | 0.0628 | 2.3017 | 0.3851 |
| mr.000111 | age, house, personal | 0.0628 | 0.9614 | 0.3847 |
| mr.100111 | time, age, house, personal | 0.0628 | 0.9599 | 0.3847 |
| mr.010111 | base, age, house, personal | 0.0628 | 1.1853 | 0.3848 |
| mr.110111 | time, base, age, house, personal | 0.0628 | 1.1909 | 0.3848 |
| mr.001111 | race, age, house, personal | 0.0628 | 1.3700 | 0.3851 |
| mr.101111 | time, race, age, house, personal | 0.0628 | 1.3842 | 0.3851 |
| mr.011111 | base, race, age, house, personal | 0.0628 | 1.5971 | 0.3868 |
| mr.base | time, base, race, age, house, personal | 0.0628 | 1.6196 | 0.3868 |

Table 20: RMS Errors of models of fire deaths for medium hazard properties.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

|  |  | **Mean** | **RMSE** | |
| --- | --- | --- | --- | --- |
| **Model Run** | **Predictors** | **Separate** | **Dummies** |
| constant |  | 0.0044 | 0.0831 | |
| fx |  | 0.0044 | 0.0832 | |
| tract |  | 0.0044 | 0.1176 | |
| lasso.min | time, base, race, age, house, personal | 0.0044 | 0.0831 | |
| lasso.1se | time, base, race, age, house, personal | 0.0044 | 0.0831 | |
| rf.0500 | time, base, race, age, house, personal | 0.0044 | 0.0855 | |
| rf.2500 | time, base, race, age, house, personal | 0.0044 | 0.0852 | |
| mr.100000 | time | 0.0044 | **0.0832** | 0.0832 |
| mr.010000 | base | 0.0044 | 0.0832 | 0.0832 |
| mr.110000 | time, base | 0.0044 | 0.0833 | 0.0832 |
| mr.001000 | race | 0.0044 | 0.0837 | 0.0832 |
| mr.101000 | time, race | 0.0044 | 0.0838 | 0.0832 |
| mr.011000 | base, race | 0.0044 | 0.0842 | 0.0838 |
| mr.111000 | time, base, race | 0.0044 | 0.0844 | 0.0838 |
| mr.000100 | age | 0.0044 | 0.0873 | 0.0832 |
| mr.100100 | time, age | 0.0044 | 0.0971 | 0.0832 |
| mr.010100 | base, age | 0.0044 | 0.0846 | 0.0835 |
| mr.110100 | time, base, age | 0.0044 | 0.0845 | 0.0835 |
| mr.001100 | race, age | 0.0044 | 0.1149 | 0.0833 |
| mr.101100 | time, race, age | 0.0044 | 0.1092 | 0.0833 |
| mr.011100 | base, race, age | 0.0044 | 0.0862 | 0.0838 |
| mr.111100 | time, base, race, age | 0.0044 | 0.0860 | 0.0838 |
| mr.000010 | house | 0.0044 | 0.0834 | 0.0832 |
| mr.100010 | time, house | 0.0044 | 0.0835 | 0.0832 |
| mr.010010 | base, house | 0.0044 | 0.0834 | 0.0832 |
| mr.110010 | time, base, house | 0.0044 | 0.0836 | 0.0832 |
| mr.001010 | race, house | 0.0044 | 0.0836 | 0.0832 |
| mr.101010 | time, race, house | 0.0044 | 0.0843 | 0.0832 |
| mr.011010 | base, race, house | 0.0044 | 0.0838 | 0.0832 |
| mr.111010 | time, base, race, house | 0.0044 | 0.0842 | 0.0832 |
| mr.000110 | age, house | 0.0044 | 0.0898 | 0.0832 |
| mr.100110 | time, age, house | 0.0044 | 0.1267 | 0.0832 |
| mr.010110 | base, age, house | 0.0044 | 0.0876 | 0.0832 |
| mr.110110 | time, base, age, house | 0.0044 | 0.0938 | 0.0832 |
| mr.001110 | race, age, house | 0.0044 | 0.0857 | 0.0832 |
| mr.101110 | time, race, age, house | 0.0044 | 0.0857 | 0.0832 |
| mr.011110 | base, race, age, house | 0.0044 | 0.4781 | 0.0832 |
| mr.111110 | time, base, race, age, house | 0.0044 | 0.1750 | 0.0832 |
| mr.000001 | personal | 0.0044 | 0.0833 | 0.0832 |
| mr.100001 | time, personal | 0.0044 | 0.0833 | 0.0832 |
| mr.010001 | base, personal | 0.0044 | 0.0833 | 0.0833 |
| mr.110001 | time, base, personal | 0.0044 | 0.0833 | 0.0833 |
| mr.001001 | race, personal | 0.0044 | 0.0835 | 0.0832 |
| mr.101001 | time, race, personal | 0.0044 | 0.0837 | 0.0832 |
| mr.011001 | base, race, personal | 0.0044 | 0.0835 | 0.0834 |
| mr.111001 | time, base, race, personal | 0.0044 | 0.0838 | 0.0834 |
| mr.000101 | age, personal | 0.0044 | 0.0930 | 0.0833 |
| mr.100101 | time, age, personal | 0.0044 | 0.1030 | 0.0833 |
| mr.010101 | base, age, personal | 0.0044 | 0.0855 | 0.0833 |
| mr.110101 | time, base, age, personal | 0.0044 | 0.0867 | 0.0833 |
| mr.001101 | race, age, personal | 0.0044 | 0.1126 | 0.0833 |
| mr.101101 | time, race, age, personal | 0.0044 | 0.1883 | 0.0833 |
| mr.011101 | base, race, age, personal | 0.0044 | 0.0911 | 0.0833 |
| mr.111101 | time, base, race, age, personal | 0.0044 | 0.1078 | 0.0833 |
| mr.000011 | house, personal | 0.0044 | 0.0837 | **0.0832** |
| mr.100011 | time, house, personal | 0.0044 | 0.0840 | 0.0832 |
| mr.010011 | base, house, personal | 0.0044 | 0.0837 | 0.0832 |
| mr.110011 | time, base, house, personal | 0.0044 | 0.0845 | 0.0832 |
| mr.001011 | race, house, personal | 0.0044 | 0.0838 | 0.0832 |
| mr.101011 | time, race, house, personal | 0.0044 | 0.0844 | 0.0832 |
| mr.011011 | base, race, house, personal | 0.0044 | 0.0944 | 0.0832 |
| mr.111011 | time, base, race, house, personal | 0.0044 | 307.3813 | 0.0832 |
| mr.000111 | age, house, personal | 0.0044 | 0.4783 | 0.0832 |
| mr.100111 | time, age, house, personal | 0.0044 | 1.85E+25 | 0.0832 |
| mr.010111 | base, age, house, personal | 0.0044 | 0.0940 | 0.0833 |
| mr.110111 | time, base, age, house, personal | 0.0044 | 0.1398 | 0.0833 |
| mr.001111 | race, age, house, personal | 0.0044 | 0.0959 | 0.0832 |
| mr.101111 | time, race, age, house, personal | 0.0044 | 0.7341 | 0.0832 |
| mr.011111 | base, race, age, house, personal | 0.0044 | 0.0932 | 0.0832 |
| mr.base | time, base, race, age, house, personal | 0.0044 | 0.1434 | 0.0833 |

# Appendix D: High-Hazard Properties: Model Results

Table 21: RMS Errors of models of fire risk for high hazard properties.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

|  |  | **Mean** | **RMSE** | |
| --- | --- | --- | --- | --- |
| **Model Run** | **Predictors** | **Separate** | **Dummies** |
| constant |  | 0.0996 | 0.6967 | |
| rsk.clss | risk class | 0.0996 | 0.6964 | |
| lasso.min | risk class, time, high.rise, base, race, age, house, personal | 0.0996 | 0.8986 | |
| lasso.1se | risk class, time, high.rise, base, race, age, house, personal | 0.0996 | 0.9370 | |
| rForest | risk class, time, high.rise, base, race, age, house, personal | 0.0996 | **0.6190** | |
| hr.0000000 | risk class | 0.0996 | 0.6904 | 0.6920 |
| hr.0000001 | risk class, personal | 0.0996 | 0.6841 | 0.6913 |
| hr.0000010 | risk class, house | 0.0996 | 0.6893 | 0.6840 |
| hr.0000011 | risk class, house, personal | 0.0996 | 0.6821 | 0.6708 |
| hr.0000100 | risk class, age | 0.0996 | 0.6883 | 0.7519 |
| hr.0000101 | risk class, age, personal | 0.0996 | 0.6822 | 0.7236 |
| hr.0000110 | risk class, age, house | 0.0996 | 0.6858 | 0.6961 |
| hr.0000111 | risk class, age, house, personal | 0.0996 | 0.6794 | 0.6785 |
| hr.0001000 | risk class, race | 0.0996 | 0.6892 | 0.7801 |
| hr.0001001 | risk class, race, personal | 0.0996 | 0.6868 | 0.6862 |
| hr.0001010 | risk class, race, house | 0.0996 | 0.6879 | 0.7317 |
| hr.0001011 | risk class, race, house, personal | 0.0996 | 0.6855 | 0.7193 |
| hr.0001100 | risk class, race, age | 0.0996 | 0.6862 | 0.6909 |
| hr.0001101 | risk class, race, age, personal | 0.0996 | 0.6830 | 0.6753 |
| hr.0001110 | risk class, race, age, house | 0.0996 | 0.6843 | 0.7129 |
| hr.0001111 | risk class, race, age, house, personal | 0.0996 | 0.6821 | 0.6850 |
| hr.0010000 | risk class, base | 0.0996 | 0.6883 | 0.7014 |
| hr.0010001 | risk class, base, personal | 0.0996 | 0.6834 | 0.6774 |
| hr.0010010 | risk class, base, house | 0.0996 | 0.6885 | 0.6908 |
| hr.0010011 | risk class, base, house, personal | 0.0996 | 0.6824 | 0.6684 |
| hr.0010100 | risk class, base, age | 0.0996 | 0.6880 | 0.7098 |
| hr.0010101 | risk class, base, age, personal | 0.0996 | 0.6816 | 0.6802 |
| hr.0010110 | risk class, base, age, house | 0.0996 | 0.6887 | 0.6825 |
| hr.0010111 | risk class, base, age, house, personal | 0.0996 | 0.6788 | 0.6684 |
| hr.0011000 | risk class, base, race | 0.0996 | 0.6883 | 0.6999 |
| hr.0011001 | risk class, base, race, personal | 0.0996 | 0.6869 | 0.6779 |
| hr.0011010 | risk class, base, race, house | 0.0996 | 0.6918 | 0.9260 |
| hr.0011011 | risk class, base, race, house, personal | 0.0996 | 0.6861 | 0.7410 |
| hr.0011100 | risk class, base, race, age | 0.0996 | 0.6869 | 0.7126 |
| hr.0011101 | risk class, base, race, age, personal | 0.0996 | 0.6849 | 0.6799 |
| hr.0011110 | risk class, base, race, age, house | 0.0996 | 0.6863 | 0.8090 |
| hr.0011111 | risk class, base, race, age, house, personal | 0.0996 | 0.6825 | 0.7380 |
| hr.0100000 | risk class, high.rise | 0.0996 | 0.6901 | 0.6906 |
| hr.0100001 | risk class, high.rise, personal | 0.0996 | 0.6825 | 0.6870 |
| hr.0100010 | risk class, high.rise, house | 0.0996 | 0.6891 | 0.6826 |
| hr.0100011 | risk class, high.rise, house, personal | 0.0996 | 0.6798 | 0.6655 |
| hr.0100100 | risk class, high.rise, age | 0.0996 | 0.6880 | 0.7655 |
| hr.0100101 | risk class, high.rise, age, personal | 0.0996 | 0.6805 | 0.7165 |
| hr.0100110 | risk class, high.rise, age, house | 0.0996 | 0.6858 | 0.6963 |
| hr.0100111 | risk class, high.rise, age, house, personal | 0.0996 | 0.6771 | 0.6804 |
| hr.0101000 | risk class, high.rise, race | 0.0996 | 0.6883 | 0.7633 |
| hr.0101001 | risk class, high.rise, race, personal | 0.0996 | 0.6846 | 0.6769 |
| hr.0101010 | risk class, high.rise, race, house | 0.0996 | 0.6858 | 0.7057 |
| hr.0101011 | risk class, high.rise, race, house, personal | 0.0996 | 0.6824 | 0.6881 |
| hr.0101100 | risk class, high.rise, race, age | 0.0996 | 0.6854 | 0.6880 |
| hr.0101101 | risk class, high.rise, race, age, personal | 0.0996 | 0.6811 | 0.6686 |
| hr.0101110 | risk class, high.rise, race, age, house | 0.0996 | 0.6830 | 0.6887 |
| hr.0101111 | risk class, high.rise, race, age, house, personal | 0.0996 | 0.6796 | 0.6707 |
| hr.0110000 | risk class, high.rise, base | 0.0996 | 0.6880 | 0.7057 |
| hr.0110001 | risk class, high.rise, base, personal | 0.0996 | 0.6819 | 0.6730 |
| hr.0110010 | risk class, high.rise, base, house | 0.0996 | 0.6885 | 0.6907 |
| hr.0110011 | risk class, high.rise, base, house, personal | 0.0996 | 0.6798 | 0.6627 |
| hr.0110100 | risk class, high.rise, base, age | 0.0996 | 0.6875 | 0.7249 |
| hr.0110101 | risk class, high.rise, base, age, personal | 0.0996 | 0.6799 | 0.6762 |
| hr.0110110 | risk class, high.rise, base, age, house | 0.0996 | 0.6894 | 0.6847 |
| hr.0110111 | risk class, high.rise, base, age, house, personal | 0.0996 | 0.6768 | 0.6698 |
| hr.0111000 | risk class, high.rise, base, race | 0.0996 | 0.6870 | 0.6904 |
| hr.0111001 | risk class, high.rise, base, race, personal | 0.0996 | 0.6848 | 0.6676 |
| hr.0111010 | risk class, high.rise, base, race, house | 0.0996 | 0.6897 | 0.8122 |
| hr.0111011 | risk class, high.rise, base, race, house, personal | 0.0996 | 0.6829 | 0.6943 |
| hr.0111100 | risk class, high.rise, base, race, age | 0.0996 | 0.6861 | 0.7029 |
| hr.0111101 | risk class, high.rise, base, race, age, personal | 0.0996 | 0.6832 | 0.6697 |
| hr.0111110 | risk class, high.rise, base, race, age, house | 0.0996 | 0.6854 | 0.7556 |
| hr.0111111 | risk class, high.rise, base, race, age, house, personal | 0.0996 | 0.6802 | 0.6960 |
| hr.1000000 | risk class, time | 0.0996 | 0.6905 | 0.6911 |
| hr.1000001 | risk class, time, personal | 0.0996 | 0.6842 | 0.6842 |
| hr.1000010 | risk class, time, house | 0.0996 | 0.6895 | 0.6821 |
| hr.1000011 | risk class, time, house, personal | 0.0996 | 0.6820 | 0.6659 |
| hr.1000100 | risk class, time, age | 0.0996 | 0.6886 | 0.7120 |
| hr.1000101 | risk class, time, age, personal | 0.0996 | 0.6823 | 0.6948 |
| hr.1000110 | risk class, time, age, house | 0.0996 | 0.6860 | 0.6823 |
| hr.1000111 | risk class, time, age, house, personal | 0.0996 | 0.6796 | 0.6686 |
| hr.1001000 | risk class, time, race | 0.0996 | 0.6890 | 0.7722 |
| hr.1001001 | risk class, time, race, personal | 0.0996 | 0.6873 | 0.6828 |
| hr.1001010 | risk class, time, race, house | 0.0996 | 0.6874 | 0.7322 |
| hr.1001011 | risk class, time, race, house, personal | 0.0996 | 0.6851 | 0.7170 |
| hr.1001100 | risk class, time, race, age | 0.0996 | 0.6873 | 0.6870 |
| hr.1001101 | risk class, time, race, age, personal | 0.0996 | 0.6838 | 0.6707 |
| hr.1001110 | risk class, time, race, age, house | 0.0996 | 0.6850 | 0.7130 |
| hr.1001111 | risk class, time, race, age, house, personal | 0.0996 | 0.6823 | 0.6828 |
| hr.1010000 | risk class, time, base | 0.0996 | 0.6884 | 0.7049 |
| hr.1010001 | risk class, time, base, personal | 0.0996 | 0.6836 | 0.6748 |
| hr.1010010 | risk class, time, base, house | 0.0996 | 0.6893 | 0.6895 |
| hr.1010011 | risk class, time, base, house, personal | 0.0996 | 0.6823 | 0.6666 |
| hr.1010100 | risk class, time, base, age | 0.0996 | 0.6882 | 0.6998 |
| hr.1010101 | risk class, time, base, age, personal | 0.0996 | 0.6819 | 0.6736 |
| hr.1010110 | risk class, time, base, age, house | 0.0996 | 0.6903 | 0.6821 |
| hr.1010111 | risk class, time, base, age, house, personal | 0.0996 | 0.6794 | 0.6670 |
| hr.1011000 | risk class, time, base, race | 0.0996 | 0.6889 | 0.6962 |
| hr.1011001 | risk class, time, base, race, personal | 0.0996 | 0.6873 | 0.6758 |
| hr.1011010 | risk class, time, base, race, house | 0.0996 | 0.6915 | 0.9203 |
| hr.1011011 | risk class, time, base, race, house, personal | 0.0996 | 0.6857 | 0.7379 |
| hr.1011100 | risk class, time, base, race, age | 0.0996 | 0.6884 | 0.7089 |
| hr.1011101 | risk class, time, base, race, age, personal | 0.0996 | 0.6863 | 0.6773 |
| hr.1011110 | risk class, time, base, race, age, house | 0.0996 | 0.6880 | 0.8086 |
| hr.1011111 | risk class, time, base, race, age, house, personal | 0.0996 | 0.6829 | 0.7343 |
| hr.1100000 | risk class, time, high.rise | 0.0996 | 0.6902 | 0.6897 |
| hr.1100001 | risk class, time, high.rise, personal | 0.0996 | 0.6827 | 0.6796 |
| hr.1100010 | risk class, time, high.rise, house | 0.0996 | 0.6893 | 0.6805 |
| hr.1100011 | risk class, time, high.rise, house, personal | 0.0996 | 0.6798 | 0.6602 |
| hr.1100100 | risk class, time, high.rise, age | 0.0996 | 0.6883 | 0.7267 |
| hr.1100101 | risk class, time, high.rise, age, personal | 0.0996 | 0.6806 | 0.6893 |
| hr.1100110 | risk class, time, high.rise, age, house | 0.0996 | 0.6860 | 0.6825 |
| hr.1100111 | risk class, time, high.rise, age, house, personal | 0.0996 | 0.6773 | 0.6695 |
| hr.1101000 | risk class, time, high.rise, race | 0.0996 | 0.6881 | 0.7551 |
| hr.1101001 | risk class, time, high.rise, race, personal | 0.0996 | 0.6850 | 0.6735 |
| hr.1101010 | risk class, time, high.rise, race, house | 0.0996 | 0.6854 | 0.7042 |
| hr.1101011 | risk class, time, high.rise, race, house, personal | 0.0996 | 0.6821 | 0.6860 |
| hr.1101100 | risk class, time, high.rise, race, age | 0.0996 | 0.6864 | 0.6866 |
| hr.1101101 | risk class, time, high.rise, race, age, personal | 0.0996 | 0.6819 | 0.6642 |
| hr.1101110 | risk class, time, high.rise, race, age, house | 0.0996 | 0.6837 | 0.6881 |
| hr.1101111 | risk class, time, high.rise, race, age, house, personal | 0.0996 | 0.6799 | 0.6685 |
| hr.1110000 | risk class, time, high.rise, base | 0.0996 | 0.6881 | 0.7091 |
| hr.1110001 | risk class, time, high.rise, base, personal | 0.0996 | 0.6821 | 0.6699 |
| hr.1110010 | risk class, time, high.rise, base, house | 0.0996 | 0.6895 | 0.6909 |
| hr.1110011 | risk class, time, high.rise, base, house, personal | 0.0996 | 0.6799 | 0.6606 |
| hr.1110100 | risk class, time, high.rise, base, age | 0.0996 | 0.6877 | 0.7191 |
| hr.1110101 | risk class, time, high.rise, base, age, personal | 0.0996 | 0.6802 | 0.6707 |
| hr.1110110 | risk class, time, high.rise, base, age, house | 0.0996 | 0.6911 | 0.6862 |
| hr.1110111 | risk class, time, high.rise, base, age, house, personal | 0.0996 | 0.6774 | 0.6684 |
| hr.1111000 | risk class, time, high.rise, base, race | 0.0996 | 0.6876 | 0.6863 |
| hr.1111001 | risk class, time, high.rise, base, race, personal | 0.0996 | 0.6852 | 0.6654 |
| hr.1111010 | risk class, time, high.rise, base, race, house | 0.0996 | 0.6898 | 0.8079 |
| hr.1111011 | risk class, time, high.rise, base, race, house, personal | 0.0996 | 0.6826 | 0.6911 |
| hr.1111100 | risk class, time, high.rise, base, race, age | 0.0996 | 0.6875 | 0.7002 |
| hr.1111101 | risk class, time, high.rise, base, race, age, personal | 0.0996 | 0.6845 | 0.6672 |
| hr.1111110 | risk class, time, high.rise, base, race, age, house | 0.0996 | 0.6871 | 0.7549 |
| hr.1111111 | risk class, time, high.rise, base, race, age, house, personal | 0.0996 | 0.6808 | 0.6937 |

Table 22: RMS Errors of models of percent of fires that grow beyond the room of origin for high hazard properties.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

|  |  | **Mean (%)** | **RMSE** | |
| --- | --- | --- | --- | --- |
| **Model Run** | **Predictors** | **Dummies** | **Separate** |
| constant |  | 0.0568 | 0.2148 | |
| rsk.clss | risk class | 0.0568 | 0.2105 | |
| lasso.min | risk class, time, high.rise, base, race, age, house, personal | 0.0568 | 0.9259 | |
| lasso.1se | risk class, time, high.rise, base, race, age, house, personal | 0.0568 | 0.9267 | |
| rForest | risk class, time, high.rise, base, race, age, house, personal | 0.0568 | **0.1597** | |
| hr.0000000 | risk class | 0.0568 | 0.2091 | 0.2043 |
| hr.0000001 | risk class, personal | 0.0568 | 0.2081 | 0.1956 |
| hr.0000010 | risk class, house | 0.0568 | 0.2068 | 0.1965 |
| hr.0000011 | risk class, house, personal | 0.0568 | 0.2054 | 0.1894 |
| hr.0000100 | risk class, age | 0.0568 | 0.2078 | 0.1945 |
| hr.0000101 | risk class, age, personal | 0.0568 | 0.2070 | 0.1874 |
| hr.0000110 | risk class, age, house | 0.0568 | 0.2057 | 0.1908 |
| hr.0000111 | risk class, age, house, personal | 0.0568 | 0.2041 | 0.1845 |
| hr.0001000 | risk class, race | 0.0568 | 0.2091 | 0.2033 |
| hr.0001001 | risk class, race, personal | 0.0568 | 0.2079 | 0.1938 |
| hr.0001010 | risk class, race, house | 0.0568 | 0.2067 | 0.1951 |
| hr.0001011 | risk class, race, house, personal | 0.0568 | 0.2050 | 0.1876 |
| hr.0001100 | risk class, race, age | 0.0568 | 0.2080 | 0.1937 |
| hr.0001101 | risk class, race, age, personal | 0.0568 | 0.2068 | 0.1868 |
| hr.0001110 | risk class, race, age, house | 0.0568 | 0.2058 | 0.1899 |
| hr.0001111 | risk class, race, age, house, personal | 0.0568 | 0.2040 | 0.1844 |
| hr.0010000 | risk class, base | 0.0568 | 0.2088 | 0.2004 |
| hr.0010001 | risk class, base, personal | 0.0568 | 0.2075 | 0.1942 |
| hr.0010010 | risk class, base, house | 0.0568 | 0.2055 | 0.1917 |
| hr.0010011 | risk class, base, house, personal | 0.0568 | 0.2047 | 0.1871 |
| hr.0010100 | risk class, base, age | 0.0568 | 0.2064 | 0.1923 |
| hr.0010101 | risk class, base, age, personal | 0.0568 | 0.2055 | 0.1871 |
| hr.0010110 | risk class, base, age, house | 0.0568 | 0.2048 | 0.1892 |
| hr.0010111 | risk class, base, age, house, personal | 0.0568 | 0.2034 | 0.1845 |
| hr.0011000 | risk class, base, race | 0.0568 | 0.2087 | 0.1998 |
| hr.0011001 | risk class, base, race, personal | 0.0568 | 0.2074 | 0.1926 |
| hr.0011010 | risk class, base, race, house | 0.0568 | 0.2056 | 0.1911 |
| hr.0011011 | risk class, base, race, house, personal | 0.0568 | 0.2047 | 0.1862 |
| hr.0011100 | risk class, base, race, age | 0.0568 | 0.2066 | 0.1912 |
| hr.0011101 | risk class, base, race, age, personal | 0.0568 | 0.2056 | 0.1865 |
| hr.0011110 | risk class, base, race, age, house | 0.0568 | 0.2048 | 0.1883 |
| hr.0011111 | risk class, base, race, age, house, personal | 0.0568 | 0.2035 | 0.1844 |
| hr.0100000 | risk class, high.rise | 0.0568 | 0.2081 | 0.2039 |
| hr.0100001 | risk class, high.rise, personal | 0.0568 | 0.2075 | 0.1949 |
| hr.0100010 | risk class, high.rise, house | 0.0568 | 0.2069 | 0.1964 |
| hr.0100011 | risk class, high.rise, house, personal | 0.0568 | 0.2056 | 0.1896 |
| hr.0100100 | risk class, high.rise, age | 0.0568 | 0.2072 | 0.1931 |
| hr.0100101 | risk class, high.rise, age, personal | 0.0568 | 0.2065 | 0.1869 |
| hr.0100110 | risk class, high.rise, age, house | 0.0568 | 0.2060 | 0.1901 |
| hr.0100111 | risk class, high.rise, age, house, personal | 0.0568 | 0.2044 | 0.1842 |
| hr.0101000 | risk class, high.rise, race | 0.0568 | 0.2081 | 0.2030 |
| hr.0101001 | risk class, high.rise, race, personal | 0.0568 | 0.2073 | 0.1936 |
| hr.0101010 | risk class, high.rise, race, house | 0.0568 | 0.2068 | 0.1945 |
| hr.0101011 | risk class, high.rise, race, house, personal | 0.0568 | 0.2053 | 0.1880 |
| hr.0101100 | risk class, high.rise, race, age | 0.0568 | 0.2074 | 0.1922 |
| hr.0101101 | risk class, high.rise, race, age, personal | 0.0568 | 0.2065 | 0.1862 |
| hr.0101110 | risk class, high.rise, race, age, house | 0.0568 | 0.2061 | 0.1891 |
| hr.0101111 | risk class, high.rise, race, age, house, personal | 0.0568 | 0.2045 | 0.1841 |
| hr.0110000 | risk class, high.rise, base | 0.0568 | 0.2081 | 0.1997 |
| hr.0110001 | risk class, high.rise, base, personal | 0.0568 | 0.2070 | 0.1930 |
| hr.0110010 | risk class, high.rise, base, house | 0.0568 | 0.2057 | 0.1916 |
| hr.0110011 | risk class, high.rise, base, house, personal | 0.0568 | 0.2050 | 0.1866 |
| hr.0110100 | risk class, high.rise, base, age | 0.0568 | 0.2061 | 0.1910 |
| hr.0110101 | risk class, high.rise, base, age, personal | 0.0568 | 0.2053 | 0.1866 |
| hr.0110110 | risk class, high.rise, base, age, house | 0.0568 | 0.2051 | 0.1883 |
| hr.0110111 | risk class, high.rise, base, age, house, personal | 0.0568 | 0.2038 | 0.1841 |
| hr.0111000 | risk class, high.rise, base, race | 0.0568 | 0.2080 | 0.1988 |
| hr.0111001 | risk class, high.rise, base, race, personal | 0.0568 | 0.2070 | 0.1912 |
| hr.0111010 | risk class, high.rise, base, race, house | 0.0568 | 0.2058 | 0.1904 |
| hr.0111011 | risk class, high.rise, base, race, house, personal | 0.0568 | 0.2050 | 0.1855 |
| hr.0111100 | risk class, high.rise, base, race, age | 0.0568 | 0.2063 | 0.1899 |
| hr.0111101 | risk class, high.rise, base, race, age, personal | 0.0568 | 0.2054 | 0.1859 |
| hr.0111110 | risk class, high.rise, base, race, age, house | 0.0568 | 0.2051 | 0.1871 |
| hr.0111111 | risk class, high.rise, base, race, age, house, personal | 0.0568 | 0.2039 | 0.1840 |
| hr.1000000 | risk class, time | 0.0568 | 0.2087 | 0.2021 |
| hr.1000001 | risk class, time, personal | 0.0568 | 0.2079 | 0.1922 |
| hr.1000010 | risk class, time, house | 0.0568 | 0.2063 | 0.1950 |
| hr.1000011 | risk class, time, house, personal | 0.0568 | 0.2049 | 0.1880 |
| hr.1000100 | risk class, time, age | 0.0568 | 0.2075 | 0.1938 |
| hr.1000101 | risk class, time, age, personal | 0.0568 | 0.2067 | 0.1869 |
| hr.1000110 | risk class, time, age, house | 0.0568 | 0.2053 | 0.1894 |
| hr.1000111 | risk class, time, age, house, personal | 0.0568 | 0.2035 | 0.1837 |
| hr.1001000 | risk class, time, race | 0.0568 | 0.2087 | 0.2013 |
| hr.1001001 | risk class, time, race, personal | 0.0568 | 0.2076 | 0.1903 |
| hr.1001010 | risk class, time, race, house | 0.0568 | 0.2062 | 0.1940 |
| hr.1001011 | risk class, time, race, house, personal | 0.0568 | 0.2046 | 0.1864 |
| hr.1001100 | risk class, time, race, age | 0.0568 | 0.2078 | 0.1932 |
| hr.1001101 | risk class, time, race, age, personal | 0.0568 | 0.2066 | 0.1863 |
| hr.1001110 | risk class, time, race, age, house | 0.0568 | 0.2054 | 0.1884 |
| hr.1001111 | risk class, time, race, age, house, personal | 0.0568 | 0.2035 | 0.1837 |
| hr.1010000 | risk class, time, base | 0.0568 | 0.2083 | 0.1981 |
| hr.1010001 | risk class, time, base, personal | 0.0568 | 0.2071 | 0.1908 |
| hr.1010010 | risk class, time, base, house | 0.0568 | 0.2051 | 0.1904 |
| hr.1010011 | risk class, time, base, house, personal | 0.0568 | 0.2043 | 0.1860 |
| hr.1010100 | risk class, time, base, age | 0.0568 | 0.2061 | 0.1914 |
| hr.1010101 | risk class, time, base, age, personal | 0.0568 | 0.2051 | 0.1867 |
| hr.1010110 | risk class, time, base, age, house | 0.0568 | 0.2044 | 0.1879 |
| hr.1010111 | risk class, time, base, age, house, personal | 0.0568 | 0.2029 | 0.1836 |
| hr.1011000 | risk class, time, base, race | 0.0568 | 0.2082 | 0.1976 |
| hr.1011001 | risk class, time, base, race, personal | 0.0568 | 0.2070 | 0.1891 |
| hr.1011010 | risk class, time, base, race, house | 0.0568 | 0.2053 | 0.1898 |
| hr.1011011 | risk class, time, base, race, house, personal | 0.0568 | 0.2043 | 0.1847 |
| hr.1011100 | risk class, time, base, race, age | 0.0568 | 0.2063 | 0.1905 |
| hr.1011101 | risk class, time, base, race, age, personal | 0.0568 | 0.2052 | 0.1861 |
| hr.1011110 | risk class, time, base, race, age, house | 0.0568 | 0.2045 | 0.1871 |
| hr.1011111 | risk class, time, base, race, age, house, personal | 0.0568 | 0.2029 | 0.1837 |
| hr.1100000 | risk class, time, high.rise | 0.0568 | 0.2076 | 0.2019 |
| hr.1100001 | risk class, time, high.rise, personal | 0.0568 | 0.2071 | 0.1918 |
| hr.1100010 | risk class, time, high.rise, house | 0.0568 | 0.2064 | 0.1944 |
| hr.1100011 | risk class, time, high.rise, house, personal | 0.0568 | 0.2052 | 0.1883 |
| hr.1100100 | risk class, time, high.rise, age | 0.0568 | 0.2069 | 0.1922 |
| hr.1100101 | risk class, time, high.rise, age, personal | 0.0568 | 0.2063 | 0.1866 |
| hr.1100110 | risk class, time, high.rise, age, house | 0.0568 | 0.2055 | 0.1888 |
| hr.1100111 | risk class, time, high.rise, age, house, personal | 0.0568 | 0.2039 | 0.1835 |
| hr.1101000 | risk class, time, high.rise, race | 0.0568 | 0.2076 | 0.2010 |
| hr.1101001 | risk class, time, high.rise, race, personal | 0.0568 | 0.2069 | 0.1907 |
| hr.1101010 | risk class, time, high.rise, race, house | 0.0568 | 0.2063 | 0.1931 |
| hr.1101011 | risk class, time, high.rise, race, house, personal | 0.0568 | 0.2048 | 0.1867 |
| hr.1101100 | risk class, time, high.rise, race, age | 0.0568 | 0.2072 | 0.1914 |
| hr.1101101 | risk class, time, high.rise, race, age, personal | 0.0568 | 0.2062 | 0.1860 |
| hr.1101110 | risk class, time, high.rise, race, age, house | 0.0568 | 0.2056 | 0.1880 |
| hr.1101111 | risk class, time, high.rise, race, age, house, personal | 0.0568 | 0.2040 | 0.1836 |
| hr.1110000 | risk class, time, high.rise, base | 0.0568 | 0.2075 | 0.1968 |
| hr.1110001 | risk class, time, high.rise, base, personal | 0.0568 | 0.2066 | 0.1904 |
| hr.1110010 | risk class, time, high.rise, base, house | 0.0568 | 0.2053 | 0.1899 |
| hr.1110011 | risk class, time, high.rise, base, house, personal | 0.0568 | 0.2046 | 0.1857 |
| hr.1110100 | risk class, time, high.rise, base, age | 0.0568 | 0.2058 | 0.1903 |
| hr.1110101 | risk class, time, high.rise, base, age, personal | 0.0568 | 0.2049 | 0.1862 |
| hr.1110110 | risk class, time, high.rise, base, age, house | 0.0568 | 0.2047 | 0.1872 |
| hr.1110111 | risk class, time, high.rise, base, age, house, personal | 0.0568 | 0.2033 | 0.1833 |
| hr.1111000 | risk class, time, high.rise, base, race | 0.0568 | 0.2075 | 0.1962 |
| hr.1111001 | risk class, time, high.rise, base, race, personal | 0.0568 | 0.2066 | 0.1885 |
| hr.1111010 | risk class, time, high.rise, base, race, house | 0.0568 | 0.2055 | 0.1889 |
| hr.1111011 | risk class, time, high.rise, base, race, house, personal | 0.0568 | 0.2046 | 0.1843 |
| hr.1111100 | risk class, time, high.rise, base, race, age | 0.0568 | 0.2060 | 0.1894 |
| hr.1111101 | risk class, time, high.rise, base, race, age, personal | 0.0568 | 0.2051 | 0.1857 |
| hr.1111110 | risk class, time, high.rise, base, race, age, house | 0.0568 | 0.2047 | 0.1864 |
| hr.1111111 | risk class, time, high.rise, base, race, age, house, personal | 0.0568 | 0.2033 | 0.1833 |

Table 23: RMS Errors of models of percent of fires that grow beyond the structure of origin for high hazard properties.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

|  |  | **Mean (%)** | **RMSE** | |
| --- | --- | --- | --- | --- |
| **Model Run** | **Predictors** | **Dummies** | **Separate** |
| constant |  | 0.0892 | 0.2774 | |
| rsk.clss | risk class | 0.0892 | 0.2689 | |
| lasso.min | risk class, time, high.rise, base, race, age, house, personal | 0.0892 | 0.8957 | |
| lasso.1se | risk class, time, high.rise, base, race, age, house, personal | 0.0892 | 0.8782 | |
| rForest | risk class, time, high.rise, base, race, age, house, personal | 0.0892 | **0.1948** | |
| hr.0000000 | risk class | 0.0892 | 0.2684 | 0.2702 |
| hr.0000001 | risk class, personal | 0.0892 | 0.2654 | 0.2391 |
| hr.0000010 | risk class, house | 0.0892 | 0.2617 | 0.2425 |
| hr.0000011 | risk class, house, personal | 0.0892 | 0.2583 | 0.2543 |
| hr.0000100 | risk class, age | 0.0892 | 0.2580 | 0.2334 |
| hr.0000101 | risk class, age, personal | 0.0892 | 0.2536 | 0.2484 |
| hr.0000110 | risk class, age, house | 0.0892 | 0.2509 | 0.2558 |
| hr.0000111 | risk class, age, house, personal | 0.0892 | 0.2475 | 0.2552 |
| hr.0001000 | risk class, race | 0.0892 | 0.2639 | 0.2336 |
| hr.0001001 | risk class, race, personal | 0.0892 | 0.2607 | 0.2302 |
| hr.0001010 | risk class, race, house | 0.0892 | 0.2583 | 0.2466 |
| hr.0001011 | risk class, race, house, personal | 0.0892 | 0.2553 | 0.2484 |
| hr.0001100 | risk class, race, age | 0.0892 | 0.2548 | 0.2463 |
| hr.0001101 | risk class, race, age, personal | 0.0892 | 0.2512 | 0.2560 |
| hr.0001110 | risk class, race, age, house | 0.0892 | 0.2478 | 0.2685 |
| hr.0001111 | risk class, race, age, house, personal | 0.0892 | 0.2454 | 0.2845 |
| hr.0010000 | risk class, base | 0.0892 | 0.2685 | 0.2633 |
| hr.0010001 | risk class, base, personal | 0.0892 | 0.2654 | 0.2348 |
| hr.0010010 | risk class, base, house | 0.0892 | 0.2574 | 0.2477 |
| hr.0010011 | risk class, base, house, personal | 0.0892 | 0.2506 | 0.2471 |
| hr.0010100 | risk class, base, age | 0.0892 | 0.2571 | 0.2414 |
| hr.0010101 | risk class, base, age, personal | 0.0892 | 0.2523 | 0.2496 |
| hr.0010110 | risk class, base, age, house | 0.0892 | 0.2451 | 0.2635 |
| hr.0010111 | risk class, base, age, house, personal | 0.0892 | 0.2403 | 0.2652 |
| hr.0011000 | risk class, base, race | 0.0892 | 0.2620 | 0.2209 |
| hr.0011001 | risk class, base, race, personal | 0.0892 | 0.2590 | 0.2344 |
| hr.0011010 | risk class, base, race, house | 0.0892 | 0.2519 | 0.2463 |
| hr.0011011 | risk class, base, race, house, personal | 0.0892 | 0.2478 | 0.2463 |
| hr.0011100 | risk class, base, race, age | 0.0892 | 0.2537 | 0.2541 |
| hr.0011101 | risk class, base, race, age, personal | 0.0892 | 0.2498 | 0.2581 |
| hr.0011110 | risk class, base, race, age, house | 0.0892 | 0.2403 | 0.2680 |
| hr.0011111 | risk class, base, race, age, house, personal | 0.0892 | 0.2382 | 0.2849 |
| hr.0100000 | risk class, high.rise | 0.0892 | 0.2679 | 0.2759 |
| hr.0100001 | risk class, high.rise, personal | 0.0892 | 0.2651 | 0.2383 |
| hr.0100010 | risk class, high.rise, house | 0.0892 | 0.2615 | 0.2449 |
| hr.0100011 | risk class, high.rise, house, personal | 0.0892 | 0.2580 | 0.2607 |
| hr.0100100 | risk class, high.rise, age | 0.0892 | 0.2577 | 0.2404 |
| hr.0100101 | risk class, high.rise, age, personal | 0.0892 | 0.2535 | 0.2550 |
| hr.0100110 | risk class, high.rise, age, house | 0.0892 | 0.2506 | 0.2701 |
| hr.0100111 | risk class, high.rise, age, house, personal | 0.0892 | 0.2474 | 0.2642 |
| hr.0101000 | risk class, high.rise, race | 0.0892 | 0.2640 | 0.2403 |
| hr.0101001 | risk class, high.rise, race, personal | 0.0892 | 0.2610 | 0.2323 |
| hr.0101010 | risk class, high.rise, race, house | 0.0892 | 0.2584 | 0.2502 |
| hr.0101011 | risk class, high.rise, race, house, personal | 0.0892 | 0.2553 | 0.2511 |
| hr.0101100 | risk class, high.rise, race, age | 0.0892 | 0.2549 | 0.2504 |
| hr.0101101 | risk class, high.rise, race, age, personal | 0.0892 | 0.2514 | 0.2629 |
| hr.0101110 | risk class, high.rise, race, age, house | 0.0892 | 0.2476 | 0.2732 |
| hr.0101111 | risk class, high.rise, race, age, house, personal | 0.0892 | 0.2455 | 0.2822 |
| hr.0110000 | risk class, high.rise, base | 0.0892 | 0.2682 | 0.2683 |
| hr.0110001 | risk class, high.rise, base, personal | 0.0892 | 0.2649 | 0.2389 |
| hr.0110010 | risk class, high.rise, base, house | 0.0892 | 0.2573 | 0.2532 |
| hr.0110011 | risk class, high.rise, base, house, personal | 0.0892 | 0.2506 | 0.2582 |
| hr.0110100 | risk class, high.rise, base, age | 0.0892 | 0.2567 | 0.2471 |
| hr.0110101 | risk class, high.rise, base, age, personal | 0.0892 | 0.2518 | 0.2643 |
| hr.0110110 | risk class, high.rise, base, age, house | 0.0892 | 0.2450 | 0.2689 |
| hr.0110111 | risk class, high.rise, base, age, house, personal | 0.0892 | 0.2404 | 0.2631 |
| hr.0111000 | risk class, high.rise, base, race | 0.0892 | 0.2619 | 0.2279 |
| hr.0111001 | risk class, high.rise, base, race, personal | 0.0892 | 0.2589 | 0.2415 |
| hr.0111010 | risk class, high.rise, base, race, house | 0.0892 | 0.2517 | 0.2571 |
| hr.0111011 | risk class, high.rise, base, race, house, personal | 0.0892 | 0.2478 | 0.2586 |
| hr.0111100 | risk class, high.rise, base, race, age | 0.0892 | 0.2535 | 0.2513 |
| hr.0111101 | risk class, high.rise, base, race, age, personal | 0.0892 | 0.2495 | 0.2669 |
| hr.0111110 | risk class, high.rise, base, race, age, house | 0.0892 | 0.2403 | 0.2696 |
| hr.0111111 | risk class, high.rise, base, race, age, house, personal | 0.0892 | 0.2384 | 0.2956 |
| hr.1000000 | risk class, time | 0.0892 | 0.2504 | 0.2155 |
| hr.1000001 | risk class, time, personal | 0.0892 | 0.2442 | 0.2191 |
| hr.1000010 | risk class, time, house | 0.0892 | 0.2453 | 0.2283 |
| hr.1000011 | risk class, time, house, personal | 0.0892 | 0.2416 | 0.2469 |
| hr.1000100 | risk class, time, age | 0.0892 | 0.2451 | 0.2384 |
| hr.1000101 | risk class, time, age, personal | 0.0892 | 0.2389 | 0.2541 |
| hr.1000110 | risk class, time, age, house | 0.0892 | 0.2407 | 0.2620 |
| hr.1000111 | risk class, time, age, house, personal | 0.0892 | 0.2360 | 0.2702 |
| hr.1001000 | risk class, time, race | 0.0892 | 0.2457 | 0.2154 |
| hr.1001001 | risk class, time, race, personal | 0.0892 | 0.2419 | 0.2285 |
| hr.1001010 | risk class, time, race, house | 0.0892 | 0.2435 | 0.2369 |
| hr.1001011 | risk class, time, race, house, personal | 0.0892 | 0.2403 | 0.2498 |
| hr.1001100 | risk class, time, race, age | 0.0892 | 0.2424 | 0.2575 |
| hr.1001101 | risk class, time, race, age, personal | 0.0892 | 0.2371 | 0.2700 |
| hr.1001110 | risk class, time, race, age, house | 0.0892 | 0.2385 | 0.2674 |
| hr.1001111 | risk class, time, race, age, house, personal | 0.0892 | 0.2347 | 0.2873 |
| hr.1010000 | risk class, time, base | 0.0892 | 0.2496 | 0.2155 |
| hr.1010001 | risk class, time, base, personal | 0.0892 | 0.2439 | 0.2267 |
| hr.1010010 | risk class, time, base, house | 0.0892 | 0.2436 | 0.2291 |
| hr.1010011 | risk class, time, base, house, personal | 0.0892 | 0.2383 | 0.2397 |
| hr.1010100 | risk class, time, base, age | 0.0892 | 0.2448 | 0.2436 |
| hr.1010101 | risk class, time, base, age, personal | 0.0892 | 0.2384 | 0.2572 |
| hr.1010110 | risk class, time, base, age, house | 0.0892 | 0.2381 | 0.2587 |
| hr.1010111 | risk class, time, base, age, house, personal | 0.0892 | 0.2328 | 0.2852 |
| hr.1011000 | risk class, time, base, race | 0.0892 | 0.2444 | 0.2161 |
| hr.1011001 | risk class, time, base, race, personal | 0.0892 | 0.2404 | 0.2277 |
| hr.1011010 | risk class, time, base, race, house | 0.0892 | 0.2409 | 0.2439 |
| hr.1011011 | risk class, time, base, race, house, personal | 0.0892 | 0.2369 | 0.2505 |
| hr.1011100 | risk class, time, base, race, age | 0.0892 | 0.2418 | 0.2479 |
| hr.1011101 | risk class, time, base, race, age, personal | 0.0892 | 0.2365 | 0.2646 |
| hr.1011110 | risk class, time, base, race, age, house | 0.0892 | 0.2348 | 0.2718 |
| hr.1011111 | risk class, time, base, race, age, house, personal | 0.0892 | 0.2314 | 0.2896 |
| hr.1100000 | risk class, time, high.rise | 0.0892 | 0.2493 | 0.2221 |
| hr.1100001 | risk class, time, high.rise, personal | 0.0892 | 0.2439 | 0.2253 |
| hr.1100010 | risk class, time, high.rise, house | 0.0892 | 0.2441 | 0.2358 |
| hr.1100011 | risk class, time, high.rise, house, personal | 0.0892 | 0.2410 | 0.2534 |
| hr.1100100 | risk class, time, high.rise, age | 0.0892 | 0.2443 | 0.2446 |
| hr.1100101 | risk class, time, high.rise, age, personal | 0.0892 | 0.2387 | 0.2639 |
| hr.1100110 | risk class, time, high.rise, age, house | 0.0892 | 0.2396 | 0.2650 |
| hr.1100111 | risk class, time, high.rise, age, house, personal | 0.0892 | 0.2356 | 0.2749 |
| hr.1101000 | risk class, time, high.rise, race | 0.0892 | 0.2453 | 0.2225 |
| hr.1101001 | risk class, time, high.rise, race, personal | 0.0892 | 0.2422 | 0.2355 |
| hr.1101010 | risk class, time, high.rise, race, house | 0.0892 | 0.2429 | 0.2428 |
| hr.1101011 | risk class, time, high.rise, race, house, personal | 0.0892 | 0.2400 | 0.2574 |
| hr.1101100 | risk class, time, high.rise, race, age | 0.0892 | 0.2421 | 0.2577 |
| hr.1101101 | risk class, time, high.rise, race, age, personal | 0.0892 | 0.2372 | 0.2746 |
| hr.1101110 | risk class, time, high.rise, race, age, house | 0.0892 | 0.2377 | 0.2716 |
| hr.1101111 | risk class, time, high.rise, race, age, house, personal | 0.0892 | 0.2346 | 0.2815 |
| hr.1110000 | risk class, time, high.rise, base | 0.0892 | 0.2486 | 0.2222 |
| hr.1110001 | risk class, time, high.rise, base, personal | 0.0892 | 0.2434 | 0.2353 |
| hr.1110010 | risk class, time, high.rise, base, house | 0.0892 | 0.2424 | 0.2445 |
| hr.1110011 | risk class, time, high.rise, base, house, personal | 0.0892 | 0.2379 | 0.2518 |
| hr.1110100 | risk class, time, high.rise, base, age | 0.0892 | 0.2440 | 0.2517 |
| hr.1110101 | risk class, time, high.rise, base, age, personal | 0.0892 | 0.2379 | 0.2704 |
| hr.1110110 | risk class, time, high.rise, base, age, house | 0.0892 | 0.2373 | 0.2643 |
| hr.1110111 | risk class, time, high.rise, base, age, house, personal | 0.0892 | 0.2326 | 0.2716 |
| hr.1111000 | risk class, time, high.rise, base, race | 0.0892 | 0.2438 | 0.2230 |
| hr.1111001 | risk class, time, high.rise, base, race, personal | 0.0892 | 0.2405 | 0.2400 |
| hr.1111010 | risk class, time, high.rise, base, race, house | 0.0892 | 0.2399 | 0.2456 |
| hr.1111011 | risk class, time, high.rise, base, race, house, personal | 0.0892 | 0.2368 | 0.2601 |
| hr.1111100 | risk class, time, high.rise, base, race, age | 0.0892 | 0.2414 | 0.2548 |
| hr.1111101 | risk class, time, high.rise, base, race, age, personal | 0.0892 | 0.2363 | 0.2801 |
| hr.1111110 | risk class, time, high.rise, base, race, age, house | 0.0892 | 0.2344 | 0.2718 |
| hr.1111111 | risk class, time, high.rise, base, race, age, house, personal | 0.0892 | 0.2315 | 0.2875 |

Table 24: RMS Errors of models of fire injuries for high hazard properties.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

|  |  | **Mean** | **RMSE** | |
| --- | --- | --- | --- | --- |
| **Model Run** | **Predictors** | **Dummies** | **Separate** |
| constant |  | 0.0030 | 0.1356 | |
| rsk.clss | risk class | 0.0030 | 0.1356 | |
| lasso.min | risk class, time, high.rise, base, race, age, house, personal | 0.0030 | 0.6045 | |
| lasso.1se | risk class, time, high.rise, base, race, age, house, personal | 0.0030 | 0.6071 | |
| rForest | risk class, time, high.rise, base, race, age, house, personal | 0.0030 | 0.1374 | |
| hr.0000000 | risk class | 0.0030 | 0.1355 | 0.1356 |
| hr.0000001 | risk class, personal | 0.0030 | 0.1354 | 0.1487 |
| hr.0000010 | risk class, house | 0.0030 | 0.1355 | 0.1352 |
| hr.0000011 | risk class, house, personal | 0.0030 | 0.1353 | 0.1383 |
| hr.0000100 | risk class, age | 0.0030 | 0.1355 | 0.2024 |
| hr.0000101 | risk class, age, personal | 0.0030 | 0.1355 | 0.1369 |
| hr.0000110 | risk class, age, house | 0.0030 | 0.1354 | 1.68E+13 |
| hr.0000111 | risk class, age, house, personal | 0.0030 | 0.1354 | 1.84E+04 |
| hr.0001000 | risk class, race | 0.0030 | 0.1356 | 0.1378 |
| hr.0001001 | risk class, race, personal | 0.0030 | 0.1354 | 0.1393 |
| hr.0001010 | risk class, race, house | 0.0030 | 0.1354 | 0.1358 |
| hr.0001011 | risk class, race, house, personal | 0.0030 | 0.1354 | 0.1347 |
| hr.0001100 | risk class, race, age | 0.0030 | 0.1355 | 0.1367 |
| hr.0001101 | risk class, race, age, personal | 0.0030 | 0.1355 | 9.38E+03 |
| hr.0001110 | risk class, race, age, house | 0.0030 | 0.1354 | 6.12E+29 |
| hr.0001111 | risk class, race, age, house, personal | 0.0030 | 0.1355 | 3.69E+04 |
| hr.0010000 | risk class, base | 0.0030 | 0.1355 | 0.1357 |
| hr.0010001 | risk class, base, personal | 0.0030 | 0.1354 | 0.1366 |
| hr.0010010 | risk class, base, house | 0.0030 | 0.1354 | 0.1351 |
| hr.0010011 | risk class, base, house, personal | 0.0030 | 0.1353 | 35.9960 |
| hr.0010100 | risk class, base, age | 0.0030 | 0.1355 | 0.1407 |
| hr.0010101 | risk class, base, age, personal | 0.0030 | 0.1355 | 2.18E+39 |
| hr.0010110 | risk class, base, age, house | 0.0030 | 0.1354 | 7.64E+29 |
| hr.0010111 | risk class, base, age, house, personal | 0.0030 | 0.1354 | 2.67E+04 |
| hr.0011000 | risk class, base, race | 0.0030 | 0.1355 | 0.1358 |
| hr.0011001 | risk class, base, race, personal | 0.0030 | 0.1354 | 0.1349 |
| hr.0011010 | risk class, base, race, house | 0.0030 | 0.1354 | 0.1386 |
| hr.0011011 | risk class, base, race, house, personal | 0.0030 | 0.1354 | 1.7652 |
| hr.0011100 | risk class, base, race, age | 0.0030 | 0.1355 | 0.1365 |
| hr.0011101 | risk class, base, race, age, personal | 0.0030 | 0.1354 | 1.49E+04 |
| hr.0011110 | risk class, base, race, age, house | 0.0030 | 0.1354 | 1.60E+17 |
| hr.0011111 | risk class, base, race, age, house, personal | 0.0030 | 0.1354 | 5.20E+04 |
| hr.0100000 | risk class, high.rise | 0.0030 | 0.1355 | 0.1356 |
| hr.0100001 | risk class, high.rise, personal | 0.0030 | 0.1354 | 0.1485 |
| hr.0100010 | risk class, high.rise, house | 0.0030 | 0.1354 | 0.1500 |
| hr.0100011 | risk class, high.rise, house, personal | 0.0030 | 0.1352 | 0.1378 |
| hr.0100100 | risk class, high.rise, age | 0.0030 | 0.1354 | 0.2022 |
| hr.0100101 | risk class, high.rise, age, personal | 0.0030 | 0.1354 | 0.1364 |
| hr.0100110 | risk class, high.rise, age, house | 0.0030 | 0.1354 | 1.89E+11 |
| hr.0100111 | risk class, high.rise, age, house, personal | 0.0030 | 0.1353 | 1.87E+04 |
| hr.0101000 | risk class, high.rise, race | 0.0030 | 0.1356 | 0.1376 |
| hr.0101001 | risk class, high.rise, race, personal | 0.0030 | 0.1353 | 0.1359 |
| hr.0101010 | risk class, high.rise, race, house | 0.0030 | 0.1353 | 0.2220 |
| hr.0101011 | risk class, high.rise, race, house, personal | 0.0030 | 0.1353 | **0.1341** |
| hr.0101100 | risk class, high.rise, race, age | 0.0030 | 0.1355 | 0.1363 |
| hr.0101101 | risk class, high.rise, race, age, personal | 0.0030 | 0.1354 | 9.24E+03 |
| hr.0101110 | risk class, high.rise, race, age, house | 0.0030 | 0.1354 | 5.69E+34 |
| hr.0101111 | risk class, high.rise, race, age, house, personal | 0.0030 | 0.1354 | 3.73E+04 |
| hr.0110000 | risk class, high.rise, base | 0.0030 | 0.1355 | 0.1357 |
| hr.0110001 | risk class, high.rise, base, personal | 0.0030 | 0.1354 | 0.1364 |
| hr.0110010 | risk class, high.rise, base, house | 0.0030 | 0.1354 | 0.1353 |
| hr.0110011 | risk class, high.rise, base, house, personal | 0.0030 | 0.1352 | 28.4462 |
| hr.0110100 | risk class, high.rise, base, age | 0.0030 | 0.1354 | 0.1402 |
| hr.0110101 | risk class, high.rise, base, age, personal | 0.0030 | 0.1354 | 6.16E+38 |
| hr.0110110 | risk class, high.rise, base, age, house | 0.0030 | 0.1354 | 1.63E+30 |
| hr.0110111 | risk class, high.rise, base, age, house, personal | 0.0030 | **0.1352** | 2.70E+04 |
| hr.0111000 | risk class, high.rise, base, race | 0.0030 | 0.1354 | 0.1356 |
| hr.0111001 | risk class, high.rise, base, race, personal | 0.0030 | 0.1353 | 0.1346 |
| hr.0111010 | risk class, high.rise, base, race, house | 0.0030 | 0.1353 | 0.1369 |
| hr.0111011 | risk class, high.rise, base, race, house, personal | 0.0030 | 0.1352 | 1.2336 |
| hr.0111100 | risk class, high.rise, base, race, age | 0.0030 | 0.1354 | 0.1357 |
| hr.0111101 | risk class, high.rise, base, race, age, personal | 0.0030 | 0.1353 | 1.58E+04 |
| hr.0111110 | risk class, high.rise, base, race, age, house | 0.0030 | 0.1353 | 6.69E+06 |
| hr.0111111 | risk class, high.rise, base, race, age, house, personal | 0.0030 | 0.1353 | 5.27E+04 |
| hr.1000000 | risk class, time | 0.0030 | 0.1355 | 0.1356 |
| hr.1000001 | risk class, time, personal | 0.0030 | 0.1354 | 0.1391 |
| hr.1000010 | risk class, time, house | 0.0030 | 0.1355 | 0.1350 |
| hr.1000011 | risk class, time, house, personal | 0.0030 | 0.1353 | 0.1359 |
| hr.1000100 | risk class, time, age | 0.0030 | 0.1355 | 0.2951 |
| hr.1000101 | risk class, time, age, personal | 0.0030 | 0.1355 | 0.1431 |
| hr.1000110 | risk class, time, age, house | 0.0030 | 0.1354 | 2.20E+03 |
| hr.1000111 | risk class, time, age, house, personal | 0.0030 | 0.1354 | 6.85E+05 |
| hr.1001000 | risk class, time, race | 0.0030 | 0.1356 | 0.1379 |
| hr.1001001 | risk class, time, race, personal | 0.0030 | 0.1354 | 0.1464 |
| hr.1001010 | risk class, time, race, house | 0.0030 | 0.1354 | 0.1356 |
| hr.1001011 | risk class, time, race, house, personal | 0.0030 | 0.1354 | 0.1350 |
| hr.1001100 | risk class, time, race, age | 0.0030 | 0.1355 | 0.1362 |
| hr.1001101 | risk class, time, race, age, personal | 0.0030 | 0.1354 | 1.03E+04 |
| hr.1001110 | risk class, time, race, age, house | 0.0030 | 0.1354 | 7.13E+14 |
| hr.1001111 | risk class, time, race, age, house, personal | 0.0030 | 0.1355 | 3.22E+04 |
| hr.1010000 | risk class, time, base | 0.0030 | 0.1355 | 0.1354 |
| hr.1010001 | risk class, time, base, personal | 0.0030 | 0.1354 | 0.1360 |
| hr.1010010 | risk class, time, base, house | 0.0030 | 0.1354 | 0.1351 |
| hr.1010011 | risk class, time, base, house, personal | 0.0030 | 0.1353 | 4.20E+10 |
| hr.1010100 | risk class, time, base, age | 0.0030 | 0.1355 | 2.1950 |
| hr.1010101 | risk class, time, base, age, personal | 0.0030 | 0.1355 | 5.65E+02 |
| hr.1010110 | risk class, time, base, age, house | 0.0030 | 0.1355 | 7.36E+15 |
| hr.1010111 | risk class, time, base, age, house, personal | 0.0030 | 0.1354 | 2.56E+04 |
| hr.1011000 | risk class, time, base, race | 0.0030 | 0.1354 | 0.1358 |
| hr.1011001 | risk class, time, base, race, personal | 0.0030 | 0.1354 | 0.1350 |
| hr.1011010 | risk class, time, base, race, house | 0.0030 | 0.1354 | 0.1390 |
| hr.1011011 | risk class, time, base, race, house, personal | 0.0030 | 0.1354 | 0.1371 |
| hr.1011100 | risk class, time, base, race, age | 0.0030 | 0.1355 | 0.3003 |
| hr.1011101 | risk class, time, base, race, age, personal | 0.0030 | 0.1354 | 1.39E+04 |
| hr.1011110 | risk class, time, base, race, age, house | 0.0030 | 0.1354 | 4.08E+06 |
| hr.1011111 | risk class, time, base, race, age, house, personal | 0.0030 | 0.1354 | 5.03E+04 |
| hr.1100000 | risk class, time, high.rise | 0.0030 | 0.1355 | 0.1355 |
| hr.1100001 | risk class, time, high.rise, personal | 0.0030 | 0.1354 | 0.1387 |
| hr.1100010 | risk class, time, high.rise, house | 0.0030 | 0.1354 | 0.1592 |
| hr.1100011 | risk class, time, high.rise, house, personal | 0.0030 | 0.1352 | 0.1351 |
| hr.1100100 | risk class, time, high.rise, age | 0.0030 | 0.1354 | 0.2198 |
| hr.1100101 | risk class, time, high.rise, age, personal | 0.0030 | 0.1354 | 0.1426 |
| hr.1100110 | risk class, time, high.rise, age, house | 0.0030 | 0.1354 | 2.21E+03 |
| hr.1100111 | risk class, time, high.rise, age, house, personal | 0.0030 | 0.1353 | 1.76E+06 |
| hr.1101000 | risk class, time, high.rise, race | 0.0030 | 0.1356 | 0.1376 |
| hr.1101001 | risk class, time, high.rise, race, personal | 0.0030 | 0.1353 | 0.1377 |
| hr.1101010 | risk class, time, high.rise, race, house | 0.0030 | 0.1353 | 0.3407 |
| hr.1101011 | risk class, time, high.rise, race, house, personal | 0.0030 | 0.1353 | 0.1341 |
| hr.1101100 | risk class, time, high.rise, race, age | 0.0030 | 0.1355 | 0.1354 |
| hr.1101101 | risk class, time, high.rise, race, age, personal | 0.0030 | 0.1354 | 1.08E+04 |
| hr.1101110 | risk class, time, high.rise, race, age, house | 0.0030 | 0.1354 | 1.71E+25 |
| hr.1101111 | risk class, time, high.rise, race, age, house, personal | 0.0030 | 0.1354 | 3.46E+04 |
| hr.1110000 | risk class, time, high.rise, base | 0.0030 | 0.1355 | 0.1353 |
| hr.1110001 | risk class, time, high.rise, base, personal | 0.0030 | 0.1354 | 0.1355 |
| hr.1110010 | risk class, time, high.rise, base, house | 0.0030 | 0.1354 | 0.1356 |
| hr.1110011 | risk class, time, high.rise, base, house, personal | 0.0030 | 0.1352 | 2.72E+10 |
| hr.1110100 | risk class, time, high.rise, base, age | 0.0030 | 0.1354 | 0.9193 |
| hr.1110101 | risk class, time, high.rise, base, age, personal | 0.0030 | 0.1354 | 3.65E+28 |
| hr.1110110 | risk class, time, high.rise, base, age, house | 0.0030 | 0.1354 | 1.95E+18 |
| hr.1110111 | risk class, time, high.rise, base, age, house, personal | 0.0030 | 0.1352 | 2.61E+04 |
| hr.1111000 | risk class, time, high.rise, base, race | 0.0030 | 0.1354 | 0.1356 |
| hr.1111001 | risk class, time, high.rise, base, race, personal | 0.0030 | 0.1353 | 0.1348 |
| hr.1111010 | risk class, time, high.rise, base, race, house | 0.0030 | 0.1353 | 0.1400 |
| hr.1111011 | risk class, time, high.rise, base, race, house, personal | 0.0030 | 0.1352 | 3.26E+14 |
| hr.1111100 | risk class, time, high.rise, base, race, age | 0.0030 | 0.1354 | 0.1357 |
| hr.1111101 | risk class, time, high.rise, base, race, age, personal | 0.0030 | 0.1353 | 1.43E+04 |
| hr.1111110 | risk class, time, high.rise, base, race, age, house | 0.0030 | 0.1353 | 2.54E+07 |
| hr.1111111 | risk class, time, high.rise, base, race, age, house, personal | 0.0030 | 0.1353 | 5.11E+04 |

Table 25: RMS Errors of models of fire deaths for high hazard properties.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

|  |  | **Mean** | **RMSE** | |
| --- | --- | --- | --- | --- |
| **Model Run** | **Predictors** | **Dummies** | **Separate** |
| constant |  | 0.0002 | 0.0157 | |
| rsk.clss | risk class | 0.0002 | 0.0157 | |
| lasso.min | risk class, time, high.rise, base, race, age, house, personal | 0.0002 | 0.5901 | |
| lasso.1se | risk class, time, high.rise, base, race, age, house, personal | 0.0002 | 0.5917 | |
| rForest | risk class, time, high.rise, base, race, age, house, personal | 0.0002 | **0.0092** | |
| hr.0000000 | risk class | 0.0002 | 0.0157 | 0.0157 |
| hr.0000001 | risk class, personal | 0.0002 | 0.0156 | Infinity |
| hr.0000010 | risk class, house | 0.0002 | 0.0156 | 0.0176 |
| hr.0000011 | risk class, house, personal | 0.0002 | 0.0147 | 4.69E+09 |
| hr.0000100 | risk class, age | 0.0002 | 0.0118 | 4.73E+07 |
| hr.0000101 | risk class, age, personal | 0.0002 | 0.0107 | 4.17E+20 |
| hr.0000110 | risk class, age, house | 0.0002 | 0.0107 | 8.46E+12 |
| hr.0000111 | risk class, age, house, personal | 0.0002 | 0.0102 | 2.09E+129 |
| hr.0001000 | risk class, race | 0.0002 | 0.0157 | 0.0160 |
| hr.0001001 | risk class, race, personal | 0.0002 | 0.0155 | 8.31E+38 |
| hr.0001010 | risk class, race, house | 0.0002 | 0.0155 | 0.1351 |
| hr.0001011 | risk class, race, house, personal | 0.0002 | 0.0141 | 1.45E+29 |
| hr.0001100 | risk class, race, age | 0.0002 | 0.0115 | 1.66E+28 |
| hr.0001101 | risk class, race, age, personal | 0.0002 | 0.0105 | 3.29E+24 |
| hr.0001110 | risk class, race, age, house | 0.0002 | 0.0107 | 5.09E+20 |
| hr.0001111 | risk class, race, age, house, personal | 0.0002 | 0.0101 | 7.50E+109 |
| hr.0010000 | risk class, base | 0.0002 | 0.0157 | 0.0157 |
| hr.0010001 | risk class, base, personal | 0.0002 | 0.0158 | 1.53E+26 |
| hr.0010010 | risk class, base, house | 0.0002 | 0.0154 | 1.34E+26 |
| hr.0010011 | risk class, base, house, personal | 0.0002 | 0.0142 | 1.42E+00 |
| hr.0010100 | risk class, base, age | 0.0002 | 0.0111 | 7.19E+28 |
| hr.0010101 | risk class, base, age, personal | 0.0002 | 0.0103 | 9.20E+12 |
| hr.0010110 | risk class, base, age, house | 0.0002 | 0.0099 | 2.11E+14 |
| hr.0010111 | risk class, base, age, house, personal | 0.0002 | 0.0095 | 5.70E+79 |
| hr.0011000 | risk class, base, race | 0.0002 | 0.0157 | 0.0158 |
| hr.0011001 | risk class, base, race, personal | 0.0002 | 0.0153 | 5.25E+13 |
| hr.0011010 | risk class, base, race, house | 0.0002 | 0.0153 | 0.0478 |
| hr.0011011 | risk class, base, race, house, personal | 0.0002 | 0.0139 | Infinity |
| hr.0011100 | risk class, base, race, age | 0.0002 | 0.0109 | 3.49E+16 |
| hr.0011101 | risk class, base, race, age, personal | 0.0002 | 0.0103 | 2.32E+55 |
| hr.0011110 | risk class, base, race, age, house | 0.0002 | 0.0099 | 3.22E+10 |
| hr.0011111 | risk class, base, race, age, house, personal | 0.0002 | 0.0095 | 2.57E+49 |
| hr.0100000 | risk class, high.rise | 0.0002 | 0.0157 | 0.0157 |
| hr.0100001 | risk class, high.rise, personal | 0.0002 | 0.0153 | Infinity |
| hr.0100010 | risk class, high.rise, house | 0.0002 | 0.0156 | 0.0237 |
| hr.0100011 | risk class, high.rise, house, personal | 0.0002 | 0.0146 | Infinity |
| hr.0100100 | risk class, high.rise, age | 0.0002 | 0.0112 | 1.06E+84 |
| hr.0100101 | risk class, high.rise, age, personal | 0.0002 | 0.0104 | Infinity |
| hr.0100110 | risk class, high.rise, age, house | 0.0002 | 0.0106 | 1.75E+134 |
| hr.0100111 | risk class, high.rise, age, house, personal | 0.0002 | 0.0101 | 1.65E+119 |
| hr.0101000 | risk class, high.rise, race | 0.0002 | 0.0157 | 0.0162 |
| hr.0101001 | risk class, high.rise, race, personal | 0.0002 | 0.0151 | 1.07E+43 |
| hr.0101010 | risk class, high.rise, race, house | 0.0002 | 0.0155 | 0.0509 |
| hr.0101011 | risk class, high.rise, race, house, personal | 0.0002 | 0.0139 | 2.87E+62 |
| hr.0101100 | risk class, high.rise, race, age | 0.0002 | 0.0109 | 3.31E+107 |
| hr.0101101 | risk class, high.rise, race, age, personal | 0.0002 | 0.0103 | Infinity |
| hr.0101110 | risk class, high.rise, race, age, house | 0.0002 | 0.0106 | Infinity |
| hr.0101111 | risk class, high.rise, race, age, house, personal | 0.0002 | 0.0100 | 2.19E+115 |
| hr.0110000 | risk class, high.rise, base | 0.0002 | 0.0157 | 0.0158 |
| hr.0110001 | risk class, high.rise, base, personal | 0.0002 | 0.0152 | 0.0086 |
| hr.0110010 | risk class, high.rise, base, house | 0.0002 | 0.0153 | 7.57E+27 |
| hr.0110011 | risk class, high.rise, base, house, personal | 0.0002 | 0.0139 | 1.31E+11 |
| hr.0110100 | risk class, high.rise, base, age | 0.0002 | 0.0106 | 3.00E+92 |
| hr.0110101 | risk class, high.rise, base, age, personal | 0.0002 | 0.0100 | 4.93E+91 |
| hr.0110110 | risk class, high.rise, base, age, house | 0.0002 | 0.0099 | Infinity |
| hr.0110111 | risk class, high.rise, base, age, house, personal | 0.0002 | 0.0095 | 3.12E+99 |
| hr.0111000 | risk class, high.rise, base, race | 0.0002 | 0.0156 | 0.0161 |
| hr.0111001 | risk class, high.rise, base, race, personal | 0.0002 | 0.0149 | 6.84E+21 |
| hr.0111010 | risk class, high.rise, base, race, house | 0.0002 | 0.0152 | 6.7242 |
| hr.0111011 | risk class, high.rise, base, race, house, personal | 0.0002 | 0.0136 | Infinity |
| hr.0111100 | risk class, high.rise, base, race, age | 0.0002 | 0.0104 | 7.42E+122 |
| hr.0111101 | risk class, high.rise, base, race, age, personal | 0.0002 | 0.0099 | 5.48E+89 |
| hr.0111110 | risk class, high.rise, base, race, age, house | 0.0002 | 0.0099 | Infinity |
| hr.0111111 | risk class, high.rise, base, race, age, house, personal | 0.0002 | 0.0094 | 3.33E+104 |
| hr.1000000 | risk class, time | 0.0002 | 0.0157 | 0.0157 |
| hr.1000001 | risk class, time, personal | 0.0002 | 0.0155 | 5.43E+07 |
| hr.1000010 | risk class, time, house | 0.0002 | 0.0156 | 0.0268 |
| hr.1000011 | risk class, time, house, personal | 0.0002 | 0.0147 | 3.56E+10 |
| hr.1000100 | risk class, time, age | 0.0002 | 0.0118 | 3.49E+09 |
| hr.1000101 | risk class, time, age, personal | 0.0002 | 0.0107 | 3.34E+27 |
| hr.1000110 | risk class, time, age, house | 0.0002 | 0.0107 | 2.03E+18 |
| hr.1000111 | risk class, time, age, house, personal | 0.0002 | 0.0102 | 5.66E+125 |
| hr.1001000 | risk class, time, race | 0.0002 | 0.0157 | 0.0160 |
| hr.1001001 | risk class, time, race, personal | 0.0002 | 0.0154 | 3.38E+16 |
| hr.1001010 | risk class, time, race, house | 0.0002 | 0.0155 | 1.0271 |
| hr.1001011 | risk class, time, race, house, personal | 0.0002 | 0.0141 | 5.85E+06 |
| hr.1001100 | risk class, time, race, age | 0.0002 | 0.0115 | 1.23E+24 |
| hr.1001101 | risk class, time, race, age, personal | 0.0002 | 0.0105 | Infinity |
| hr.1001110 | risk class, time, race, age, house | 0.0002 | 0.0107 | 8.05E+30 |
| hr.1001111 | risk class, time, race, age, house, personal | 0.0002 | 0.0101 | 4.03E+116 |
| hr.1010000 | risk class, time, base | 0.0002 | 0.0157 | 0.0304 |
| hr.1010001 | risk class, time, base, personal | 0.0002 | 0.0158 | 1.79E+12 |
| hr.1010010 | risk class, time, base, house | 0.0002 | 0.0154 | 7.40E+19 |
| hr.1010011 | risk class, time, base, house, personal | 0.0002 | 0.0141 | Infinity |
| hr.1010100 | risk class, time, base, age | 0.0002 | 0.0111 | 1.80E+15 |
| hr.1010101 | risk class, time, base, age, personal | 0.0002 | 0.0103 | 8.43E+13 |
| hr.1010110 | risk class, time, base, age, house | 0.0002 | 0.0099 | 5.47E+33 |
| hr.1010111 | risk class, time, base, age, house, personal | 0.0002 | 0.0095 | 1.55E+74 |
| hr.1011000 | risk class, time, base, race | 0.0002 | 0.0157 | 8.43E+129 |
| hr.1011001 | risk class, time, base, race, personal | 0.0002 | 0.0153 | 0.0114 |
| hr.1011010 | risk class, time, base, race, house | 0.0002 | 0.0152 | 1.56E+07 |
| hr.1011011 | risk class, time, base, race, house, personal | 0.0002 | 0.0139 | Infinity |
| hr.1011100 | risk class, time, base, race, age | 0.0002 | 0.0109 | 1.05E+19 |
| hr.1011101 | risk class, time, base, race, age, personal | 0.0002 | 0.0103 | 1.97E+68 |
| hr.1011110 | risk class, time, base, race, age, house | 0.0002 | 0.0099 | 1.07E+23 |
| hr.1011111 | risk class, time, base, race, age, house, personal | 0.0002 | 0.0095 | 3.11E+73 |
| hr.1100000 | risk class, time, high.rise | 0.0002 | 0.0157 | 0.0157 |
| hr.1100001 | risk class, time, high.rise, personal | 0.0002 | 0.0153 | Infinity |
| hr.1100010 | risk class, time, high.rise, house | 0.0002 | 0.0156 | 0.0357 |
| hr.1100011 | risk class, time, high.rise, house, personal | 0.0002 | 0.0146 | Infinity |
| hr.1100100 | risk class, time, high.rise, age | 0.0002 | 0.0112 | 3.67E+100 |
| hr.1100101 | risk class, time, high.rise, age, personal | 0.0002 | 0.0104 | Infinity |
| hr.1100110 | risk class, time, high.rise, age, house | 0.0002 | 0.0106 | 8.22E+144 |
| hr.1100111 | risk class, time, high.rise, age, house, personal | 0.0002 | 0.0101 | 9.72E+122 |
| hr.1101000 | risk class, time, high.rise, race | 0.0002 | 0.0157 | 0.0162 |
| hr.1101001 | risk class, time, high.rise, race, personal | 0.0002 | 0.0151 | 1.68E+21 |
| hr.1101010 | risk class, time, high.rise, race, house | 0.0002 | 0.0154 | 0.1798 |
| hr.1101011 | risk class, time, high.rise, race, house, personal | 0.0002 | 0.0138 | 2.86E+10 |
| hr.1101100 | risk class, time, high.rise, race, age | 0.0002 | 0.0109 | 6.28E+96 |
| hr.1101101 | risk class, time, high.rise, race, age, personal | 0.0002 | 0.0103 | Infinity |
| hr.1101110 | risk class, time, high.rise, race, age, house | 0.0002 | 0.0106 | 2.26E+149 |
| hr.1101111 | risk class, time, high.rise, race, age, house, personal | 0.0002 | 0.0100 | 5.49E+106 |
| hr.1110000 | risk class, time, high.rise, base | 0.0002 | 0.0157 | 0.0301 |
| hr.1110001 | risk class, time, high.rise, base, personal | 0.0002 | 0.0152 | 7.51E+12 |
| hr.1110010 | risk class, time, high.rise, base, house | 0.0002 | 0.0153 | 7.91E+18 |
| hr.1110011 | risk class, time, high.rise, base, house, personal | 0.0002 | 0.0139 | 6.98E+03 |
| hr.1110100 | risk class, time, high.rise, base, age | 0.0002 | 0.0106 | 5.49E+71 |
| hr.1110101 | risk class, time, high.rise, base, age, personal | 0.0002 | 0.0100 | 3.24E+22 |
| hr.1110110 | risk class, time, high.rise, base, age, house | 0.0002 | 0.0098 | Infinity |
| hr.1110111 | risk class, time, high.rise, base, age, house, personal | 0.0002 | 0.0095 | 3.28E+96 |
| hr.1111000 | risk class, time, high.rise, base, race | 0.0002 | 0.0156 | 4.34E+130 |
| hr.1111001 | risk class, time, high.rise, base, race, personal | 0.0002 | 0.0149 | 0.0110 |
| hr.1111010 | risk class, time, high.rise, base, race, house | 0.0002 | 0.0152 | 3.78E+06 |
| hr.1111011 | risk class, time, high.rise, base, race, house, personal | 0.0002 | 0.0136 | Infinity |
| hr.1111100 | risk class, time, high.rise, base, race, age | 0.0002 | 0.0104 | 4.34E+96 |
| hr.1111101 | risk class, time, high.rise, base, race, age, personal | 0.0002 | 0.0099 | 3.83E+55 |
| hr.1111110 | risk class, time, high.rise, base, race, age, house | 0.0002 | 0.0098 | 6.17E+146 |
| hr.1111111 | risk class, time, high.rise, base, race, age, house, personal | 0.0002 | 0.0094 | 6.70E+94 |

# Appendix E: EMS Model Results

Table 26: RMS Errors of the models for EMS risk based on the 500-cities data set.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

| Model | Year | Base | Demographic | Housing | Personal | Fuel | Health1a | Health2a | Region | Department | S | L | C |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ems.5.const | No | No | No | No | No | No | No | No | No | No | 419.7 |  |  |
| ems.5.fx | No | No | No | No | No | No | No | No | No | Yes | 389.7 |  |  |
| ems.5.lasso.1se | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | 407.9 |  |  |
| ems.5.lasso.min | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | 387.3 |  |  |
| ems.5.rf | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | 383.1 |  |  |
| ems.5.000 | Yes | No | No | No | No | No | No | No | No | Yes | 389.6 | 3.90E+02 | 389.6 |
| ems.5.001 | Yes | Yes | No | No | No | No | No | No | No | Yes | 388.5 | 3.87E+02 | 713.4 |
| ems.5.002 | Yes | No | Yes | No | No | No | No | No | Yes | Yes | 509.1 | 2.44E+03 | 464.8 |
| ems.5.003 | Yes | Yes | Yes | No | No | No | No | No | Yes | Yes | 423.6 | 4.87E+03 | 409.9 |
| ems.5.004 | Yes | No | No | Yes | No | No | No | No | No | Yes | 373.3 | 4.48E+02 | 374.4 |
| ems.5.005 | Yes | Yes | No | Yes | No | No | No | No | No | Yes | 373.6 | 3.83E+02 | 373.2 |
| ems.5.006 | Yes | No | Yes | Yes | No | No | No | No | Yes | Yes | 414.0 | 3.67E+06 | 389.1 |
| ems.5.007 | Yes | Yes | Yes | Yes | No | No | No | No | No | Yes | 448.8 | 1.51E+06 | 396.0 |
| ems.5.008 | Yes | No | No | No | Yes | No | No | No | No | Yes | 372.5 | 3.74E+02 | 9.21E+06 |
| ems.5.009 | Yes | Yes | No | No | Yes | No | No | No | Yes | Yes | 372.3 | 3.71E+02 | 371.1 |
| ems.5.010 | Yes | No | Yes | No | Yes | No | No | No | No | Yes | 404.1 | 4.41E+04 | 397.4 |
| ems.5.011 | Yes | Yes | Yes | No | Yes | No | No | No | No | Yes | 378.5 | 3.73E+03 | 372.9 |
| ems.5.012 | Yes | No | No | Yes | Yes | No | No | No | No | Yes | 376.0 | 3.26E+15 | 372.5 |
| ems.5.013 | Yes | Yes | No | Yes | Yes | No | No | No | No | Yes | 372.4 | 4.28E+02 | 371.3 |
| ems.5.014 | Yes | No | Yes | Yes | Yes | No | No | No | Yes | Yes | 412.7 | 1.56E+05 | 386.3 |
| ems.5.015 | Yes | Yes | Yes | Yes | Yes | No | No | No | Yes | Yes | 399.5 | 4.28E+03 | 370.3 |
| ems.5.016 | Yes | No | No | No | No | Yes | No | No | No | Yes | 390.9 | 2.78E+03 | 390.8 |
| ems.5.017 | Yes | Yes | No | No | No | Yes | No | No | Yes | Yes | 391.6 | 1.31E+05 | 393.4 |
| ems.5.018 | Yes | No | Yes | No | No | Yes | No | No | Yes | Yes | 1803.2 | 7.31E+03 | 978.6 |
| ems.5.019 | Yes | Yes | Yes | No | No | Yes | No | No | Yes | Yes | 927.4 | 1.09E+04 | 678.7 |
| ems.5.020 | Yes | No | No | Yes | No | Yes | No | No | Yes | Yes | 373.3 | 7.26E+02 | 374.0 |
| ems.5.021 | Yes | Yes | No | Yes | No | Yes | No | No | Yes | Yes | 373.6 | 6.02E+02 | 373.9 |
| ems.5.022 | Yes | No | Yes | Yes | No | Yes | No | No | Yes | Yes | 416.6 | 3.11E+04 | 395.9 |
| ems.5.023 | Yes | Yes | Yes | Yes | No | Yes | No | No | Yes | Yes | 461.9 | 2.92E+04 | 416.1 |
| ems.5.024 | Yes | No | No | No | Yes | Yes | No | No | No | Yes | 380.6 | 2.12E+03 | 382.1 |
| ems.5.025 | Yes | Yes | No | No | Yes | Yes | No | No | No | Yes | 377.3 | 5.76E+03 | 374.8 |
| ems.5.026 | Yes | No | Yes | No | Yes | Yes | No | No | Yes | Yes | 492.7 | 1.23E+04 | 489.5 |
| ems.5.027 | Yes | Yes | Yes | No | Yes | Yes | No | No | Yes | Yes | 377.9 | 1.59E+04 | 378.7 |
| ems.5.028 | Yes | No | No | Yes | Yes | Yes | No | No | Yes | Yes | 372.9 | 6.45E+02 | 370.8 |
| ems.5.029 | Yes | Yes | No | Yes | Yes | Yes | No | No | Yes | Yes | 372.8 | 9.05E+02 | 370.8 |
| ems.5.030 | Yes | No | Yes | Yes | Yes | Yes | No | No | Yes | Yes | 382.2 | 1.00E+04 | 378.9 |
| ems.5.031 | Yes | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | 377.3 | 2.25E+04 | 369.1 |
| ems.5.032 | Yes | No | No | No | No | No | Yes | No | No | Yes | 378.2 | 2.78E+25 | 378.8 |
| ems.5.033 | Yes | Yes | No | No | No | No | Yes | No | No | Yes | 373.2 | 4.36E+02 | 371.3 |
| ems.5.034 | Yes | No | Yes | No | No | No | Yes | No | Yes | Yes | 714.0 | 2.30E+03 | 727.3 |
| ems.5.035 | Yes | Yes | Yes | No | No | No | Yes | No | Yes | Yes | 443.4 | 8.03E+05 | 495.2 |
| ems.5.036 | Yes | No | No | Yes | No | No | Yes | No | No | Yes | 374.2 | 9.34E+02 | 370.7 |
| ems.5.037 | Yes | Yes | No | Yes | No | No | Yes | No | Yes | Yes | 373.5 | 7.91E+02 | 371.2 |
| ems.5.038 | Yes | No | Yes | Yes | No | No | Yes | No | Yes | Yes | 479.0 | 8.05E+03 | 440.5 |
| ems.5.039 | Yes | Yes | Yes | Yes | No | No | Yes | No | Yes | Yes | 495.3 | 3.94E+03 | 484.3 |
| ems.5.040 | Yes | No | No | No | Yes | No | Yes | No | Yes | Yes | 369.5 | 4.20E+02 | 370.1 |
| ems.5.041 | Yes | Yes | No | No | Yes | No | Yes | No | Yes | Yes | 368.5 | 6.58E+02 | 369.0 |
| ems.5.042 | Yes | No | Yes | No | Yes | No | Yes | No | Yes | Yes | 509.5 | 8.06E+04 | 536.2 |
| ems.5.043 | Yes | Yes | Yes | No | Yes | No | Yes | No | Yes | Yes | 397.8 | 2.86E+05 | 412.4 |
| ems.5.044 | Yes | No | No | Yes | Yes | No | Yes | No | No | Yes | 369.9 | 8.74E+02 | 369.5 |
| ems.5.045 | Yes | Yes | No | Yes | Yes | No | Yes | No | Yes | Yes | 368.6 | 1.25E+03 | 369.1 |
| ems.5.046 | Yes | No | Yes | Yes | Yes | No | Yes | No | Yes | Yes | 426.8 | 2.07E+03 | 401.8 |
| ems.5.047 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | Yes | Yes | 409.2 | 6.57E+06 | 387.5 |
| ems.5.048 | Yes | No | No | No | No | Yes | Yes | No | Yes | Yes | 387.7 | 1.41E+03 | 381.7 |
| ems.5.049 | Yes | Yes | No | No | No | Yes | Yes | No | Yes | Yes | 385.3 | 9.32E+03 | 381.8 |
| ems.5.050 | Yes | No | Yes | No | No | Yes | Yes | No | Yes | Yes | 1619.2 | 9.25E+03 | 926.3 |
| ems.5.051 | Yes | Yes | Yes | No | No | Yes | Yes | No | Yes | Yes | 577.4 | 4.80E+03 | 607.0 |
| ems.5.052 | Yes | No | No | Yes | No | Yes | Yes | No | Yes | Yes | 372.2 | 5.12E+03 | 373.4 |
| ems.5.053 | Yes | Yes | No | Yes | No | Yes | Yes | No | Yes | Yes | 372.2 | 7.82E+02 | 374.1 |
| ems.5.054 | Yes | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes | 432.5 | 2.12E+05 | 418.8 |
| ems.5.055 | Yes | Yes | Yes | Yes | No | Yes | Yes | No | Yes | Yes | 445.1 | 2.54E+05 | 452.9 |
| ems.5.056 | Yes | No | No | No | Yes | Yes | Yes | No | Yes | Yes | 378.9 | 7.79E+02 | 376.3 |
| ems.5.057 | Yes | Yes | No | No | Yes | Yes | Yes | No | Yes | Yes | 374.9 | 6.06E+02 | 374.2 |
| ems.5.058 | Yes | No | Yes | No | Yes | Yes | Yes | No | Yes | Yes | 636.6 | 7.45E+05 | 484.5 |
| ems.5.059 | Yes | Yes | Yes | No | Yes | Yes | Yes | No | Yes | Yes | 392.0 | 5.35E+04 | 396.5 |
| ems.5.060 | Yes | No | No | Yes | Yes | Yes | Yes | No | Yes | Yes | 367.6 | 5.61E+02 | 371.0 |
| ems.5.061 | Yes | Yes | No | Yes | Yes | Yes | Yes | No | Yes | Yes | 367.9 | 1.49E+03 | 370.7 |
| ems.5.062 | Yes | No | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | 385.1 | 6.91E+06 | 392.8 |
| ems.5.063 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | 378.5 | 1.89E+07 | 380.4 |
| ems.5.064 | Yes | No | No | No | No | No | No | Yes | No | Yes | 381.9 | 1.34E+03 | 382.2 |
| ems.5.065 | Yes | Yes | No | No | No | No | No | Yes | Yes | Yes | 375.2 | 1.28E+03 | 373.5 |
| ems.5.066 | Yes | No | Yes | No | No | No | No | Yes | Yes | Yes | 579.5 | 2.70E+04 | 608.8 |
| ems.5.067 | Yes | Yes | Yes | No | No | No | No | Yes | Yes | Yes | 404.1 | 1.01E+09 | 451.4 |
| ems.5.068 | Yes | No | No | Yes | No | No | No | Yes | Yes | Yes | 375.4 | 7.57E+09 | 385.8 |
| ems.5.069 | Yes | Yes | No | Yes | No | No | No | Yes | Yes | Yes | 375.9 | 3.11E+06 | 401.7 |
| ems.5.070 | Yes | No | Yes | Yes | No | No | No | Yes | Yes | Yes | 483.4 | 7.52E+08 | 428.1 |
| ems.5.071 | Yes | Yes | Yes | Yes | No | No | No | Yes | Yes | Yes | 492.6 | 6.26E+09 | 457.7 |
| ems.5.072 | Yes | No | No | No | Yes | No | No | Yes | No | Yes | 369.3 | 4.76E+03 | 375.9 |
| ems.5.073 | Yes | Yes | No | No | Yes | No | No | Yes | Yes | Yes | 368.8 | 3.41E+06 | 374.9 |
| ems.5.074 | Yes | No | Yes | No | Yes | No | No | Yes | Yes | Yes | 503.5 | 4.79E+04 | 507.1 |
| ems.5.075 | Yes | Yes | Yes | No | Yes | No | No | Yes | Yes | Yes | 398.1 | 3.38E+03 | 420.2 |
| ems.5.076 | Yes | No | No | Yes | Yes | No | No | Yes | Yes | Yes | 370.0 | 1.60E+06 | 375.4 |
| ems.5.077 | Yes | Yes | No | Yes | Yes | No | No | Yes | Yes | Yes | 368.7 | 8.92E+07 | 390.1 |
| ems.5.078 | Yes | No | Yes | Yes | Yes | No | No | Yes | Yes | Yes | 447.3 | 1.20E+09 | 396.0 |
| ems.5.079 | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | Yes | 426.9 | 2.12E+10 | 387.1 |
| ems.5.080 | Yes | No | No | No | No | Yes | No | Yes | No | Yes | 382.1 | 4.20E+02 | 382.0 |
| ems.5.081 | Yes | Yes | No | No | No | Yes | No | Yes | Yes | Yes | 379.0 | 4.02E+02 | 379.2 |
| ems.5.082 | Yes | No | Yes | No | No | Yes | No | Yes | Yes | Yes | 1137.6 | 1.15E+04 | 632.3 |
| ems.5.083 | Yes | Yes | Yes | No | No | Yes | No | Yes | Yes | Yes | 471.5 | 1.80E+04 | 492.9 |
| ems.5.084 | Yes | No | No | Yes | No | Yes | No | Yes | Yes | Yes | 373.9 | 7.27E+03 | 381.2 |
| ems.5.085 | Yes | Yes | No | Yes | No | Yes | No | Yes | Yes | Yes | 375.6 | 9.72E+03 | 391.3 |
| ems.5.086 | Yes | No | Yes | Yes | No | Yes | No | Yes | Yes | Yes | 423.8 | 4.67E+05 | 396.6 |
| ems.5.087 | Yes | Yes | Yes | Yes | No | Yes | No | Yes | Yes | Yes | 438.6 | 6.07E+04 | 426.6 |
| ems.5.088 | Yes | No | No | No | Yes | Yes | No | Yes | Yes | Yes | 371.3 | 4.43E+02 | 380.8 |
| ems.5.089 | Yes | Yes | No | No | Yes | Yes | No | Yes | No | Yes | 370.4 | 4.61E+02 | 380.1 |
| ems.5.090 | Yes | No | Yes | No | Yes | Yes | No | Yes | Yes | Yes | 566.0 | 1.63E+05 | 438.8 |
| ems.5.091 | Yes | Yes | Yes | No | Yes | Yes | No | Yes | Yes | Yes | 388.9 | 1.62E+06 | 392.3 |
| ems.5.092 | Yes | No | No | Yes | Yes | Yes | No | Yes | Yes | Yes | 366.5 | 2.07E+04 | 374.4 |
| ems.5.093 | Yes | Yes | No | Yes | Yes | Yes | No | Yes | Yes | Yes | 367.9 | 8.73E+04 | 383.7 |
| ems.5.094 | Yes | No | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | 390.4 | 8.83E+09 | 381.7 |
| ems.5.095 | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | 385.6 | 1.98E+06 | 375.6 |
| ems.5.096 | Yes | No | No | No | No | No | Yes | Yes | Yes | Yes | 378.2 | 8.09E+19 | 380.0 |
| ems.5.097 | Yes | Yes | No | No | No | No | Yes | Yes | No | Yes | 370.3 | 2.92E+19 | 371.1 |
| ems.5.098 | Yes | No | Yes | No | No | No | Yes | Yes | Yes | Yes | 543.1 | 3.59E+25 | 543.2 |
| ems.5.099 | Yes | Yes | Yes | No | No | No | Yes | Yes | Yes | Yes | 410.6 | 4.10E+15 | 436.9 |
| ems.5.100 | Yes | No | No | Yes | No | No | Yes | Yes | Yes | Yes | 373.8 | 2.47E+08 | 370.5 |
| ems.5.101 | Yes | Yes | No | Yes | No | No | Yes | Yes | Yes | Yes | 373.6 | 7.05E+16 | 374.4 |
| ems.5.102 | Yes | No | Yes | Yes | No | No | Yes | Yes | Yes | Yes | 456.2 | Inf | 412.0 |
| ems.5.103 | Yes | Yes | Yes | Yes | No | No | Yes | Yes | Yes | Yes | 488.0 | 3.32E+19 | 451.0 |
| ems.5.104 | Yes | No | No | No | Yes | No | Yes | Yes | No | Yes | 365.3 | 1.68E+18 | 366.5 |
| ems.5.105 | Yes | Yes | No | No | Yes | No | Yes | Yes | Yes | Yes | 364.6 | 2.06E+32 | 365.3 |
| ems.5.106 | Yes | No | Yes | No | Yes | No | Yes | Yes | Yes | Yes | 496.5 | 7.75E+31 | 467.2 |
| ems.5.107 | Yes | Yes | Yes | No | Yes | No | Yes | Yes | Yes | Yes | 406.1 | Inf | 413.4 |
| ems.5.108 | Yes | No | No | Yes | Yes | No | Yes | Yes | Yes | Yes | 367.7 | 2.73E+11 | 366.7 |
| ems.5.109 | Yes | Yes | No | Yes | Yes | No | Yes | Yes | Yes | Yes | 366.5 | 1.09E+52 | 367.2 |
| ems.5.110 | Yes | No | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | 432.3 | 4.64E+16 | 385.6 |
| ems.5.111 | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | 431.8 | 3.20E+28 | 389.2 |
| ems.5.112 | Yes | No | No | No | No | Yes | Yes | Yes | Yes | Yes | 378.0 | 6.50E+06 | 378.5 |
| ems.5.113 | Yes | Yes | No | No | No | Yes | Yes | Yes | Yes | Yes | 373.2 | 2.11E+06 | 376.9 |
| ems.5.114 | Yes | No | Yes | No | No | Yes | Yes | Yes | Yes | Yes | 816.9 | 4.27E+05 | 541.4 |
| ems.5.115 | Yes | Yes | Yes | No | No | Yes | Yes | Yes | Yes | Yes | 445.4 | 3.24E+05 | 455.0 |
| ems.5.116 | Yes | No | No | Yes | No | Yes | Yes | Yes | Yes | Yes | 369.1 | 1.29E+07 | 372.0 |
| ems.5.117 | Yes | Yes | No | Yes | No | Yes | Yes | Yes | Yes | Yes | 369.3 | 6.85E+06 | 378.3 |
| ems.5.118 | Yes | No | Yes | Yes | No | Yes | Yes | Yes | No | Yes | 400.0 | 2.13E+11 | 389.8 |
| ems.5.119 | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | No | Yes | 417.4 | 2.68E+13 | 416.8 |
| ems.5.120 | Yes | No | No | No | Yes | Yes | Yes | Yes | Yes | Yes | 366.8 | 1.02E+05 | 369.2 |
| ems.5.121 | Yes | Yes | No | No | Yes | Yes | Yes | Yes | Yes | Yes | 365.7 | 5.78E+05 | 368.4 |
| ems.5.122 | Yes | No | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | 508.7 | 6.77E+05 | 418.0 |
| ems.5.123 | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | No | Yes | 385.3 | 1.27E+10 | 389.3 |
| ems.5.124 | Yes | No | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | **362.9** | 1.39E+04 | 368.7 |
| ems.5.125 | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 363.4 | 2.89E+04 | 370.0 |
| ems.5.126 | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 378.2 | 6.63E+09 | 379.2 |
| ems.5.127 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 379.2 | 1.97E+12 | 378.2 |

Table 27:RMS Errors of the models for EMS risk based on the county health data set.

Model(s) with the lowest RMS Error are in bold. A blank field indicates that the relevant model was not run.

| Model | Year | Base | Demographic | Housing | Personal | Fuel | Health1b | Health2b | Health3b | Region | Department | S | L | C | Notes |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ems.C.const | No | No | No | No | No | No | No | No | No | No | No | 386.7 |  |  |  |
| ems.C.fx | No | No | No | No | No | No | No | No | No | No | Yes | 356.2 |  |  |  |
| ems.C.lasso.min | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | 348.0 |  |  |  |
| ems.C.lasso.1se | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | 360.1 |  |  |  |
| ems.C.rf | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | 330.1 |  |  |  |
| ems.C.000 | Yes | No | No | No | No | No | No | No | No | No | Yes | 356.2 | 3.56E+02 | 356.4 |  |
| ems.C.001 | Yes | Yes | No | No | No | No | No | No | No | No | Yes | 351.3 | 3.50E+02 | 350.8 |  |
| ems.C.002 | Yes | No | Yes | No | No | No | No | No | No | No | Yes | 436.5 | 4.07E+02 | 397.3 |  |
| ems.C.003 | Yes | Yes | Yes | No | No | No | No | No | No | No | Yes | 377.6 | 3.75E+02 | 360.7 |  |
| ems.C.004 | Yes | No | No | Yes | No | No | No | No | No | No | Yes | 546.9 | 3.41E+02 | 336.3 |  |
| ems.C.005 | Yes | Yes | No | Yes | No | No | No | No | No | No | Yes | 563.0 | 3.39E+02 | 335.7 |  |
| ems.C.006 | Yes | No | Yes | Yes | No | No | No | No | No | No | Yes | 485.1 | 3.48E+02 | 343.5 |  |
| ems.C.007 | Yes | Yes | Yes | Yes | No | No | No | No | No | Yes | Yes | 483.5 | 3.63E+02 | 342.8 |  |
| ems.C.008 | Yes | No | No | No | Yes | No | No | No | No | No | Yes | 335.6 | 3.37E+02 | 336.2 |  |
| ems.C.009 | Yes | Yes | No | No | Yes | No | No | No | No | No | Yes | 335.0 | 3.35E+02 | 335.3 |  |
| ems.C.010 | Yes | No | Yes | No | Yes | No | No | No | No | No | Yes | 341.2 | 3.66E+02 | 348.0 |  |
| ems.C.011 | Yes | Yes | Yes | No | Yes | No | No | No | No | No | Yes | 333.6 | 3.51E+02 | 332.2 |  |
| ems.C.012 | Yes | No | No | Yes | Yes | No | No | No | No | No | Yes | 369.8 | 3.44E+02 | 332.6 |  |
| ems.C.013 | Yes | Yes | No | Yes | Yes | No | No | No | No | No | Yes | 365.9 | 3.49E+02 | 330.7 |  |
| ems.C.014 | Yes | No | Yes | Yes | Yes | No | No | No | No | Yes | Yes | 400.2 | 3.57E+02 | 342.2 |  |
| ems.C.015 | Yes | Yes | Yes | Yes | Yes | No | No | No | No | Yes | Yes | 386.7 | 3.58E+02 | 345.5 |  |
| ems.C.016 | Yes | No | No | No | No | Yes | No | No | No | No | Yes | 353.4 | 3.82E+02 | 352.8 |  |
| ems.C.017 | Yes | Yes | No | No | No | Yes | No | No | No | No | Yes | 351.9 | 3.77E+02 | 350.8 |  |
| ems.C.018 | Yes | No | Yes | No | No | Yes | No | No | No | Yes | Yes | 1025.0 | 6.85E+02 | 650.8 |  |
| ems.C.019 | Yes | Yes | Yes | No | No | Yes | No | No | No | Yes | Yes | 539.9 | 5.43E+02 | 435.2 |  |
| ems.C.020 | Yes | No | No | Yes | No | Yes | No | No | No | No | Yes | 521.7 | 3.46E+02 | 336.5 |  |
| ems.C.021 | Yes | Yes | No | Yes | No | Yes | No | No | No | No | Yes | 533.2 | 3.45E+02 | 336.2 |  |
| ems.C.022 | Yes | No | Yes | Yes | No | Yes | No | No | No | No | Yes | 462.9 | 3.66E+02 | 338.2 |  |
| ems.C.023 | Yes | Yes | Yes | Yes | No | Yes | No | No | No | Yes | Yes | 457.2 | 3.97E+02 | 338.7 |  |
| ems.C.024 | Yes | No | No | No | Yes | Yes | No | No | No | No | Yes | 339.6 | 3.67E+02 | 337.0 |  |
| ems.C.025 | Yes | Yes | No | No | Yes | Yes | No | No | No | No | Yes | 338.9 | 3.59E+02 | 335.4 |  |
| ems.C.026 | Yes | No | Yes | No | Yes | Yes | No | No | No | No | Yes | 381.4 | 4.35E+02 | 373.5 |  |
| ems.C.027 | Yes | Yes | Yes | No | Yes | Yes | No | No | No | No | Yes | 335.9 | 3.81E+02 | 331.7 |  |
| ems.C.028 | Yes | No | No | Yes | Yes | Yes | No | No | No | No | Yes | 374.8 | 3.62E+02 | 331.6 |  |
| ems.C.029 | Yes | Yes | No | Yes | Yes | Yes | No | No | No | Yes | Yes | 375.2 | 3.65E+02 | 329.9 |  |
| ems.C.030 | Yes | No | Yes | Yes | Yes | Yes | No | No | No | Yes | Yes | 400.6 | 3.97E+02 | 337.0 |  |
| ems.C.031 | Yes | Yes | Yes | Yes | Yes | Yes | No | No | No | Yes | Yes | 389.2 | 3.89E+02 | 329.0 |  |
| ems.C.032 | Yes | No | No | No | No | No | Yes | No | No | No | Yes | 356.1 | 2.70E+03 | 343.1 | \* |
| ems.C.033 | Yes | Yes | No | No | No | No | Yes | No | No | No | Yes | 351.2 | 1.39E+06 | 338.0 | \* |
| ems.C.034 | Yes | No | Yes | No | No | No | Yes | No | No | Yes | Yes | 443.7 | 1.59E+04 | 384.3 | \* |
| ems.C.035 | Yes | Yes | Yes | No | No | No | Yes | No | No | Yes | Yes | 384.8 | 2.85E+06 | 351.7 | \* |
| ems.C.036 | Yes | No | No | Yes | No | No | Yes | No | No | No | Yes | 551.5 | 1.92E+05 | 321.7 | \* |
| ems.C.037 | Yes | Yes | No | Yes | No | No | Yes | No | No | No | Yes | 565.8 | 3.25E+06 | 321.9 | \* |
| ems.C.038 | Yes | No | Yes | Yes | No | No | Yes | No | No | Yes | Yes | 508.6 | 2.62E+05 | 328.2 | \* |
| ems.C.039 | Yes | Yes | Yes | Yes | No | No | Yes | No | No | No | Yes | 515.1 | 8.68E+07 | 331.8 | \* |
| ems.C.040 | Yes | No | No | No | Yes | No | Yes | No | No | No | Yes | 335.6 | 6.88E+05 | 325.1 | \* |
| ems.C.041 | Yes | Yes | No | No | Yes | No | Yes | No | No | No | Yes | 335.1 | 4.39E+07 | 323.8 | \* |
| ems.C.042 | Yes | No | Yes | No | Yes | No | Yes | No | No | No | Yes | 340.3 | 1.06E+06 | 329.5 | \* |
| ems.C.043 | Yes | Yes | Yes | No | Yes | No | Yes | No | No | Yes | Yes | 334.2 | 3.38E+07 | 318.6 | \* |
| ems.C.044 | Yes | No | No | Yes | Yes | No | Yes | No | No | No | Yes | 371.0 | 6.62E+05 | 316.2 | \* |
| ems.C.045 | Yes | Yes | No | Yes | Yes | No | Yes | No | No | No | Yes | 366.7 | 1.32E+08 | 317.1 | \* |
| ems.C.046 | Yes | No | Yes | Yes | Yes | No | Yes | No | No | Yes | Yes | 404.8 | 1.28E+06 | 312.1 | \* |
| ems.C.047 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No | Yes | Yes | 390.7 | 2.36E+09 | 311.2 | \* |
| ems.C.048 | Yes | No | No | No | No | Yes | Yes | No | No | No | Yes | 353.8 | 2.08E+03 | 338.9 | \* |
| ems.C.049 | Yes | Yes | No | No | No | Yes | Yes | No | No | No | Yes | 352.0 | 2.26E+05 | 337.3 | \* |
| ems.C.050 | Yes | No | Yes | No | No | Yes | Yes | No | No | No | Yes | 977.3 | 6.01E+03 | 499.1 | \* |
| ems.C.051 | Yes | Yes | Yes | No | No | Yes | Yes | No | No | Yes | Yes | 552.6 | 3.14E+05 | 387.1 | \* |
| ems.C.052 | Yes | No | No | Yes | No | Yes | Yes | No | No | No | Yes | 532.4 | 3.04E+04 | 321.7 | \* |
| ems.C.053 | Yes | Yes | No | Yes | No | Yes | Yes | No | No | No | Yes | 543.0 | 1.37E+05 | 322.0 | \* |
| ems.C.054 | Yes | No | Yes | Yes | No | Yes | Yes | No | No | Yes | Yes | 476.3 | 1.66E+05 | 319.8 | \* |
| ems.C.055 | Yes | Yes | Yes | Yes | No | Yes | Yes | No | No | Yes | Yes | 478.3 | 8.51E+06 | 322.0 | \* |
| ems.C.056 | Yes | No | No | No | Yes | Yes | Yes | No | No | No | Yes | 337.2 | 5.37E+04 | 324.2 | \* |
| ems.C.057 | Yes | Yes | No | No | Yes | Yes | Yes | No | No | No | Yes | 336.7 | 1.20E+06 | 323.8 | \* |
| ems.C.058 | Yes | No | Yes | No | Yes | Yes | Yes | No | No | Yes | Yes | 366.2 | 3.45E+05 | 334.1 | \* |
| ems.C.059 | Yes | Yes | Yes | No | Yes | Yes | Yes | No | No | No | Yes | 335.9 | 3.75E+06 | 315.9 | \* |
| ems.C.060 | Yes | No | No | Yes | Yes | Yes | Yes | No | No | No | Yes | 377.3 | 1.72E+05 | 315.9 | \* |
| ems.C.061 | Yes | Yes | No | Yes | Yes | Yes | Yes | No | No | No | Yes | 377.0 | 5.38E+06 | 316.8 | \* |
| ems.C.062 | Yes | No | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | 403.9 | 8.55E+05 | 310.9 | \* |
| ems.C.063 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | 392.5 | 2.07E+08 | 310.8 | \* |
| ems.C.064 | Yes | No | No | No | No | No | No | Yes | No | No | Yes | 356.3 | 9.56E+06 | 342.4 | \* |
| ems.C.065 | Yes | Yes | No | No | No | No | No | Yes | No | No | Yes | 351.3 | 2.34E+07 | 336.6 | \* |
| ems.C.066 | Yes | No | Yes | No | No | No | No | Yes | No | Yes | Yes | 444.3 | 1.83E+08 | 383.6 | \* |
| ems.C.067 | Yes | Yes | Yes | No | No | No | No | Yes | No | Yes | Yes | 385.2 | 2.01E+08 | 351.1 | \* |
| ems.C.068 | Yes | No | No | Yes | No | No | No | Yes | No | No | Yes | 542.8 | 4.97E+07 | 320.9 | \* |
| ems.C.069 | Yes | Yes | No | Yes | No | No | No | Yes | No | No | Yes | 557.6 | 7.52E+07 | 321.0 | \* |
| ems.C.070 | Yes | No | Yes | Yes | No | No | No | Yes | No | No | Yes | 510.3 | 1.08E+08 | 327.6 | \* |
| ems.C.071 | Yes | Yes | Yes | Yes | No | No | No | Yes | No | Yes | Yes | 517.4 | 1.24E+08 | 331.3 | \* |
| ems.C.072 | Yes | No | No | No | Yes | No | No | Yes | No | No | Yes | 335.6 | 8.50E+07 | 321.3 | \* |
| ems.C.073 | Yes | Yes | No | No | Yes | No | No | Yes | No | No | Yes | 335.0 | 1.60E+08 | 320.5 | \* |
| ems.C.074 | Yes | No | Yes | No | Yes | No | No | Yes | No | Yes | Yes | 340.7 | 1.71E+08 | 329.2 | \* |
| ems.C.075 | Yes | Yes | Yes | No | Yes | No | No | Yes | No | Yes | Yes | 334.3 | 1.87E+08 | 318.3 | \* |
| ems.C.076 | Yes | No | No | Yes | Yes | No | No | Yes | No | No | Yes | 371.5 | 8.63E+07 | 315.1 | \* |
| ems.C.077 | Yes | Yes | No | Yes | Yes | No | No | Yes | No | No | Yes | 367.2 | 1.34E+08 | 314.6 | \* |
| ems.C.078 | Yes | No | Yes | Yes | Yes | No | No | Yes | No | Yes | Yes | 406.9 | 1.20E+08 | 311.9 | \* |
| ems.C.079 | Yes | Yes | Yes | Yes | Yes | No | No | Yes | No | Yes | Yes | 392.6 | 1.46E+08 | 310.9 | \* |
| ems.C.080 | Yes | No | No | No | No | Yes | No | Yes | No | No | Yes | 353.6 | 1.07E+07 | 337.9 | \* |
| ems.C.081 | Yes | Yes | No | No | No | Yes | No | Yes | No | No | Yes | 351.8 | 2.20E+07 | 336.2 | \* |
| ems.C.082 | Yes | No | Yes | No | No | Yes | No | Yes | No | Yes | Yes | 919.0 | 6.80E+07 | 498.4 | \* |
| ems.C.083 | Yes | Yes | Yes | No | No | Yes | No | Yes | No | Yes | Yes | 529.2 | 8.24E+07 | 386.4 | \* |
| ems.C.084 | Yes | No | No | Yes | No | Yes | No | Yes | No | No | Yes | 521.2 | 2.52E+07 | 320.9 | \* |
| ems.C.085 | Yes | Yes | No | Yes | No | Yes | No | Yes | No | No | Yes | 531.7 | 3.93E+07 | 321.1 | \* |
| ems.C.086 | Yes | No | Yes | Yes | No | Yes | No | Yes | No | Yes | Yes | 474.6 | 5.63E+07 | 319.3 | \* |
| ems.C.087 | Yes | Yes | Yes | Yes | No | Yes | No | Yes | No | Yes | Yes | 475.1 | 6.80E+07 | 321.4 | \* |
| ems.C.088 | Yes | No | No | No | Yes | Yes | No | Yes | No | No | Yes | 337.3 | 4.27E+07 | 320.9 | \* |
| ems.C.089 | Yes | Yes | No | No | Yes | Yes | No | Yes | No | No | Yes | 336.8 | 7.81E+07 | 320.3 | \* |
| ems.C.090 | Yes | No | Yes | No | Yes | Yes | No | Yes | No | No | Yes | 366.7 | 8.56E+07 | 333.9 | \* |
| ems.C.091 | Yes | Yes | Yes | No | Yes | Yes | No | Yes | No | No | Yes | 335.9 | 8.68E+07 | 315.6 | \* |
| ems.C.092 | Yes | No | No | Yes | Yes | Yes | No | Yes | No | No | Yes | 376.7 | 4.65E+07 | 315.0 | \* |
| ems.C.093 | Yes | Yes | No | Yes | Yes | Yes | No | Yes | No | No | Yes | 376.8 | 6.84E+07 | 314.5 | \* |
| ems.C.094 | Yes | No | Yes | Yes | Yes | Yes | No | Yes | No | No | Yes | 404.5 | 6.22E+07 | 310.8 | \* |
| ems.C.095 | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | No | Yes | Yes | 393.0 | 7.63E+07 | 310.6 | \* |
| ems.C.096 | Yes | No | No | No | No | No | Yes | Yes | No | No | Yes | 356.2 | 1.56E+07 | 356.7 | \* |
| ems.C.097 | Yes | Yes | No | No | No | No | Yes | Yes | No | No | Yes | 351.3 | 1.25E+07 | 430.1 | \* |
| ems.C.098 | Yes | No | Yes | No | No | No | Yes | Yes | No | Yes | Yes | 446.6 | 2.04E+07 | 444.2 | \* |
| ems.C.099 | Yes | Yes | Yes | No | No | No | Yes | Yes | No | Yes | Yes | 386.5 | 2.62E+07 | 397.2 | \* |
| ems.C.100 | Yes | No | No | Yes | No | No | Yes | Yes | No | No | Yes | 555.0 | 2.54E+07 | 379.0 | \* |
| ems.C.101 | Yes | Yes | No | Yes | No | No | Yes | Yes | No | No | Yes | 568.4 | 2.20E+07 | 401.8 | \* |
| ems.C.102 | Yes | No | Yes | Yes | No | No | Yes | Yes | No | Yes | Yes | 515.2 | 9.92E+06 | 388.3 | \* |
| ems.C.103 | Yes | Yes | Yes | Yes | No | No | Yes | Yes | No | No | Yes | 521.3 | 9.72E+06 | 393.2 | \* |
| ems.C.104 | Yes | No | No | No | Yes | No | Yes | Yes | No | No | Yes | 335.8 | 1.12E+07 | 601.7 | \* |
| ems.C.105 | Yes | Yes | No | No | Yes | No | Yes | Yes | No | No | Yes | 335.3 | 1.24E+07 | 618.3 | \* |
| ems.C.106 | Yes | No | Yes | No | Yes | No | Yes | Yes | No | Yes | Yes | 341.2 | 9.34E+06 | 392.3 | \* |
| ems.C.107 | Yes | Yes | Yes | No | Yes | No | Yes | Yes | No | Yes | Yes | 334.8 | 9.11E+06 | 378.6 | \* |
| ems.C.108 | Yes | No | No | Yes | Yes | No | Yes | Yes | No | No | Yes | 373.0 | 1.97E+07 | 450.5 | \* |
| ems.C.109 | Yes | Yes | No | Yes | Yes | No | Yes | Yes | No | No | Yes | 368.5 | 1.87E+07 | 648.6 | \* |
| ems.C.110 | Yes | No | Yes | Yes | Yes | No | Yes | Yes | No | Yes | Yes | 409.2 | 8.51E+06 | 377.7 | \* |
| ems.C.111 | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | No | Yes | Yes | 394.6 | 7.68E+06 | 376.9 | \* |
| ems.C.112 | Yes | No | No | No | No | Yes | Yes | Yes | No | No | Yes | 353.5 | 2.40E+07 | 434.1 | \* |
| ems.C.113 | Yes | Yes | No | No | No | Yes | Yes | Yes | No | No | Yes | 351.8 | 1.91E+07 | 464.1 | \* |
| ems.C.114 | Yes | No | Yes | No | No | Yes | Yes | Yes | No | No | Yes | 916.6 | 1.50E+07 | 577.4 | \* |
| ems.C.115 | Yes | Yes | Yes | No | No | Yes | Yes | Yes | No | Yes | Yes | 531.9 | 1.62E+07 | 452.4 | \* |
| ems.C.116 | Yes | No | No | Yes | No | Yes | Yes | Yes | No | No | Yes | 533.2 | 2.85E+07 | 398.6 | \* |
| ems.C.117 | Yes | Yes | No | Yes | No | Yes | Yes | Yes | No | No | Yes | 542.5 | 2.40E+07 | 428.2 | \* |
| ems.C.118 | Yes | No | Yes | Yes | No | Yes | Yes | Yes | No | Yes | Yes | 477.2 | 8.53E+06 | 406.2 | \* |
| ems.C.119 | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | No | Yes | Yes | 476.9 | 8.27E+06 | 410.5 | \* |
| ems.C.120 | Yes | No | No | No | Yes | Yes | Yes | Yes | No | No | Yes | 337.3 | 1.15E+07 | 753.2 | \* |
| ems.C.121 | Yes | Yes | No | No | Yes | Yes | Yes | Yes | No | No | Yes | 336.8 | 1.20E+07 | 837.3 | \* |
| ems.C.122 | Yes | No | Yes | No | Yes | Yes | Yes | Yes | No | Yes | Yes | 365.4 | 7.67E+06 | 444.9 | \* |
| ems.C.123 | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | No | Yes | Yes | 336.1 | 7.18E+06 | 411.7 | \* |
| ems.C.124 | Yes | No | No | Yes | Yes | Yes | Yes | Yes | No | No | Yes | 378.6 | 2.33E+07 | 488.4 | \* |
| ems.C.125 | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | No | No | Yes | 378.5 | 2.07E+07 | 764.5 | \* |
| ems.C.126 | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | 406.8 | 7.72E+06 | 408.0 | \* |
| ems.C.127 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | 395.1 | 6.95E+06 | 407.7 | \* |
| ems.C.128 | Yes | No | No | No | No | No | No | No | Yes | No | Yes | 356.3 | 7.05E+06 | 322.5 | \* |
| ems.C.129 | Yes | Yes | No | No | No | No | No | No | Yes | No | Yes | 351.2 | 6.20E+06 | 308.3 | \* |
| ems.C.130 | Yes | No | Yes | No | No | No | No | No | Yes | No | Yes | 448.9 | 7.58E+06 | 296.1 | \* |
| ems.C.131 | Yes | Yes | Yes | No | No | No | No | No | Yes | Yes | Yes | 387.4 | 3.11E+06 | 288.4 | \* |
| ems.C.132 | Yes | No | No | Yes | No | No | No | No | Yes | No | Yes | 550.4 | 5.45E+06 | 278.7 | \* |
| ems.C.133 | Yes | Yes | No | Yes | No | No | No | No | Yes | No | Yes | 561.7 | 6.86E+06 | 280.5 | \* |
| ems.C.134 | Yes | No | Yes | Yes | No | No | No | No | Yes | Yes | Yes | 518.1 | 2.42E+06 | 296.8 | \* |
| ems.C.135 | Yes | Yes | Yes | Yes | No | No | No | No | Yes | Yes | Yes | 525.3 | 4.32E+06 | 295.1 | \* |
| ems.C.136 | Yes | No | No | No | Yes | No | No | No | Yes | No | Yes | 335.6 | 1.92E+07 | 353.3 | \* |
| ems.C.137 | Yes | Yes | No | No | Yes | No | No | No | Yes | No | Yes | 335.0 | 1.86E+07 | 353.4 | \* |
| ems.C.138 | Yes | No | Yes | No | Yes | No | No | No | Yes | Yes | Yes | 341.6 | 2.03E+06 | 307.4 | \* |
| ems.C.139 | Yes | Yes | Yes | No | Yes | No | No | No | Yes | Yes | Yes | 335.0 | 3.79E+06 | 289.7 | \* |
| ems.C.140 | Yes | No | No | Yes | Yes | No | No | No | Yes | No | Yes | 372.3 | 4.55E+06 | 301.3 | \* |
| ems.C.141 | Yes | Yes | No | Yes | Yes | No | No | No | Yes | No | Yes | 367.2 | 6.03E+06 | 364.2 | \* |
| ems.C.142 | Yes | No | Yes | Yes | Yes | No | No | No | Yes | Yes | Yes | 409.1 | 1.66E+06 | 316.1 | \* |
| ems.C.143 | Yes | Yes | Yes | Yes | Yes | No | No | No | Yes | Yes | Yes | 394.2 | 4.81E+06 | 310.2 | \* |
| ems.C.144 | Yes | No | No | No | No | Yes | No | No | Yes | No | Yes | 353.6 | 5.01E+06 | 308.5 | \* |
| ems.C.145 | Yes | Yes | No | No | No | Yes | No | No | Yes | No | Yes | 351.8 | 2.27E+07 | 306.6 | \* |
| ems.C.146 | Yes | No | Yes | No | No | Yes | No | No | Yes | Yes | Yes | 931.0 | 5.94E+06 | 298.4 | \* |
| ems.C.147 | Yes | Yes | Yes | No | No | Yes | No | No | Yes | Yes | Yes | 534.7 | 3.39E+06 | 290.0 | \* |
| ems.C.148 | Yes | No | No | Yes | No | Yes | No | No | Yes | No | Yes | 528.4 | 2.98E+06 | 279.6 | \* |
| ems.C.149 | Yes | Yes | No | Yes | No | Yes | No | No | Yes | No | Yes | 535.9 | 3.96E+06 | 281.7 | \* |
| ems.C.150 | Yes | No | Yes | Yes | No | Yes | No | No | Yes | Yes | Yes | 477.0 | 1.37E+06 | 295.8 | \* |
| ems.C.151 | Yes | Yes | Yes | Yes | No | Yes | No | No | Yes | Yes | Yes | 478.1 | 1.40E+06 | 293.4 | \* |
| ems.C.152 | Yes | No | No | No | Yes | Yes | No | No | Yes | No | Yes | 337.0 | 1.96E+07 | 355.4 | \* |
| ems.C.153 | Yes | Yes | No | No | Yes | Yes | No | No | Yes | No | Yes | 336.5 | 1.94E+07 | 374.0 | \* |
| ems.C.154 | Yes | No | Yes | No | Yes | Yes | No | No | Yes | Yes | Yes | 366.5 | 1.60E+06 | 317.5 | \* |
| ems.C.155 | Yes | Yes | Yes | No | Yes | Yes | No | No | Yes | Yes | Yes | 336.3 | 2.67E+06 | 296.7 | \* |
| ems.C.156 | Yes | No | No | Yes | Yes | Yes | No | No | Yes | No | Yes | 377.6 | 2.23E+06 | 303.3 | \* |
| ems.C.157 | Yes | Yes | No | Yes | Yes | Yes | No | No | Yes | No | Yes | 376.7 | 2.46E+06 | 372.9 | \* |
| ems.C.158 | Yes | No | Yes | Yes | Yes | Yes | No | No | Yes | Yes | Yes | 405.3 | 7.80E+05 | 325.5 | \* |
| ems.C.159 | Yes | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | Yes | 393.6 | 1.01E+06 | 319.9 | \* |
| ems.C.160 | Yes | No | No | No | No | No | Yes | No | Yes | No | Yes | 356.9 | 8.29E+04 | 32 442.0 | \* |
| ems.C.161 | Yes | Yes | No | No | No | No | Yes | No | Yes | No | Yes | 351.6 | 1.33E+05 | 11 700.6 | \* |
| ems.C.162 | Yes | No | Yes | No | No | No | Yes | No | Yes | Yes | Yes | 451.5 | 9.42E+04 | 11 182.6 | \* |
| ems.C.163 | Yes | Yes | Yes | No | No | No | Yes | No | Yes | Yes | Yes | 388.7 | 8.98E+04 | 9358.3 | \* |
| ems.C.164 | Yes | No | No | Yes | No | No | Yes | No | Yes | No | Yes | 563.5 | 3.25E+04 | 9708.7 | \* |
| ems.C.165 | Yes | Yes | No | Yes | No | No | Yes | No | Yes | Yes | Yes | 574.8 | 2.85E+04 | 11 129.2 | \* |
| ems.C.166 | Yes | No | Yes | Yes | No | No | Yes | No | Yes | Yes | Yes | 521.2 | 2.29E+04 | 19 123.3 | \* |
| ems.C.167 | Yes | Yes | Yes | Yes | No | No | Yes | No | Yes | Yes | Yes | 528.8 | 2.16E+04 | 21 076.7 | \* |
| ems.C.168 | Yes | No | No | No | Yes | No | Yes | No | Yes | No | Yes | 336.4 | 5.85E+04 | 6467.6 | \* |
| ems.C.169 | Yes | Yes | No | No | Yes | No | Yes | No | Yes | No | Yes | 335.8 | 6.41E+04 | 6658.2 | \* |
| ems.C.170 | Yes | No | Yes | No | Yes | No | Yes | No | Yes | Yes | Yes | 342.6 | 1.09E+05 | 7070.4 | \* |
| ems.C.171 | Yes | Yes | Yes | No | Yes | No | Yes | No | Yes | Yes | Yes | 335.8 | 8.42E+04 | 6508.6 | \* |
| ems.C.172 | Yes | No | No | Yes | Yes | No | Yes | No | Yes | No | Yes | 375.1 | 4.95E+04 | 8784.1 | \* |
| ems.C.173 | Yes | Yes | No | Yes | Yes | No | Yes | No | Yes | No | Yes | 369.7 | 3.36E+04 | 8370.4 | \* |
| ems.C.174 | Yes | No | Yes | Yes | Yes | No | Yes | No | Yes | Yes | Yes | 411.0 | 4.05E+04 | 11 576.5 | \* |
| ems.C.175 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | Yes | Yes | Yes | 395.8 | 4.03E+04 | 12 128.6 | \* |
| ems.C.176 | Yes | No | No | No | No | Yes | Yes | No | Yes | No | Yes | 354.1 | 9.75E+04 | 24 638.5 | \* |
| ems.C.177 | Yes | Yes | No | No | No | Yes | Yes | No | Yes | Yes | Yes | 352.4 | 1.43E+05 | 13 609.0 | \* |
| ems.C.178 | Yes | No | Yes | No | No | Yes | Yes | No | Yes | Yes | Yes | 934.0 | 1.16E+05 | 11 892.9 | \* |
| ems.C.179 | Yes | Yes | Yes | No | No | Yes | Yes | No | Yes | Yes | Yes | 537.0 | 1.19E+05 | 9768.3 | \* |
| ems.C.180 | Yes | No | No | Yes | No | Yes | Yes | No | Yes | No | Yes | 540.6 | 4.07E+04 | 10 210.0 | \* |
| ems.C.181 | Yes | Yes | No | Yes | No | Yes | Yes | No | Yes | No | Yes | 548.1 | 3.76E+04 | 12 234.2 | \* |
| ems.C.182 | Yes | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes | Yes | 478.9 | 3.41E+04 | 20 539.6 | \* |
| ems.C.183 | Yes | Yes | Yes | Yes | No | Yes | Yes | No | Yes | Yes | Yes | 479.9 | 3.31E+04 | 22 560.9 | \* |
| ems.C.184 | Yes | No | No | No | Yes | Yes | Yes | No | Yes | No | Yes | 338.0 | 5.54E+04 | 9509.2 | \* |
| ems.C.185 | Yes | Yes | No | No | Yes | Yes | Yes | No | Yes | No | Yes | 337.5 | 6.27E+04 | 9756.5 | \* |
| ems.C.186 | Yes | No | Yes | No | Yes | Yes | Yes | No | Yes | Yes | Yes | 367.7 | 1.05E+05 | 7423.0 | \* |
| ems.C.187 | Yes | Yes | Yes | No | Yes | Yes | Yes | No | Yes | Yes | Yes | 337.2 | 8.61E+04 | 6169.5 | \* |
| ems.C.188 | Yes | No | No | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | 380.9 | 6.01E+04 | 10 835.9 | \* |
| ems.C.189 | Yes | Yes | No | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | 380.0 | 4.29E+04 | 10 190.2 | \* |
| ems.C.190 | Yes | No | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | 407.2 | 5.13E+04 | 10 806.8 | \* |
| ems.C.191 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | 395.4 | 5.12E+04 | 11 372.3 | \* |
| ems.C.192 | Yes | No | No | No | No | No | No | Yes | Yes | No | Yes | 358.5 | 1.95E+05 | 295.7 | \* |
| ems.C.193 | Yes | Yes | No | No | No | No | No | Yes | Yes | No | Yes | 352.7 | 2.31E+05 | 285.5 | \* |
| ems.C.194 | Yes | No | Yes | No | No | No | No | Yes | Yes | Yes | Yes | 453.0 | 2.42E+05 | 284.4 | \* |
| ems.C.195 | Yes | Yes | Yes | No | No | No | No | Yes | Yes | Yes | Yes | 390.0 | 2.12E+05 | 282.3 | \* |
| ems.C.196 | Yes | No | No | Yes | No | No | No | Yes | Yes | No | Yes | 565.9 | 1.09E+05 | 271.9 | \* |
| ems.C.197 | Yes | Yes | No | Yes | No | No | No | Yes | Yes | No | Yes | 575.1 | 1.44E+05 | 270.7 | \* |
| ems.C.198 | Yes | No | Yes | Yes | No | No | No | Yes | Yes | Yes | Yes | 523.4 | 1.46E+05 | 269.6 | \* |
| ems.C.199 | Yes | Yes | Yes | Yes | No | No | No | Yes | Yes | Yes | Yes | 530.9 | 1.67E+05 | 269.5 | \* |
| ems.C.200 | Yes | No | No | No | Yes | No | No | Yes | Yes | No | Yes | 337.4 | 7.36E+04 | 277.1 | \* |
| ems.C.201 | Yes | Yes | No | No | Yes | No | No | Yes | Yes | Yes | Yes | 336.8 | 6.78E+04 | 275.2 | \* |
| ems.C.202 | Yes | No | Yes | No | Yes | No | No | Yes | Yes | Yes | Yes | 344.3 | 9.89E+04 | 275.2 | \* |
| ems.C.203 | Yes | Yes | Yes | No | Yes | No | No | Yes | Yes | Yes | Yes | 336.7 | 9.08E+04 | 270.8 | \* |
| ems.C.204 | Yes | No | No | Yes | Yes | No | No | Yes | Yes | No | Yes | 375.7 | 9.17E+04 | 265.0 | \* |
| ems.C.205 | Yes | Yes | No | Yes | Yes | No | No | Yes | Yes | No | Yes | 370.7 | 9.79E+04 | 261.4 | \* |
| ems.C.206 | Yes | No | Yes | Yes | Yes | No | No | Yes | Yes | Yes | Yes | 413.0 | 8.26E+04 | 262.0 | \* |
| ems.C.207 | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | Yes | Yes | 397.6 | 8.41E+04 | 262.8 | \* |
| ems.C.208 | Yes | No | No | No | No | Yes | No | Yes | Yes | No | Yes | 355.0 | 2.15E+05 | 292.3 | \* |
| ems.C.209 | Yes | Yes | No | No | No | Yes | No | Yes | Yes | No | Yes | 353.9 | 3.65E+05 | 292.6 | \* |
| ems.C.210 | Yes | No | Yes | No | No | Yes | No | Yes | Yes | Yes | Yes | 945.4 | 1.66E+05 | 292.5 | \* |
| ems.C.211 | Yes | Yes | Yes | No | No | Yes | No | Yes | Yes | Yes | Yes | 543.5 | 1.41E+05 | 287.2 | \* |
| ems.C.212 | Yes | No | No | Yes | No | Yes | No | Yes | Yes | No | Yes | 543.1 | 1.15E+05 | 276.6 | \* |
| ems.C.213 | Yes | Yes | No | Yes | No | Yes | No | Yes | Yes | No | Yes | 548.5 | 1.83E+05 | 273.3 | \* |
| ems.C.214 | Yes | No | Yes | Yes | No | Yes | No | Yes | Yes | Yes | Yes | 482.7 | 1.02E+05 | 275.4 | \* |
| ems.C.215 | Yes | Yes | Yes | Yes | No | Yes | No | Yes | Yes | Yes | Yes | 484.5 | 9.66E+04 | 274.6 | \* |
| ems.C.216 | Yes | No | No | No | Yes | Yes | No | Yes | Yes | No | Yes | 338.7 | 9.32E+04 | 280.5 | \* |
| ems.C.217 | Yes | Yes | No | No | Yes | Yes | No | Yes | Yes | No | Yes | 338.2 | 9.86E+04 | 277.8 | \* |
| ems.C.218 | Yes | No | Yes | No | Yes | Yes | No | Yes | Yes | Yes | Yes | 370.9 | 8.35E+04 | 283.3 | \* |
| ems.C.219 | Yes | Yes | Yes | No | Yes | Yes | No | Yes | Yes | Yes | Yes | 338.5 | 7.90E+04 | 274.9 | \* |
| ems.C.220 | Yes | No | No | Yes | Yes | Yes | No | Yes | Yes | No | Yes | 381.5 | 8.82E+04 | 267.6 | \* |
| ems.C.221 | Yes | Yes | No | Yes | Yes | Yes | No | Yes | Yes | No | Yes | 380.8 | 9.98E+04 | 263.7 | \* |
| ems.C.222 | Yes | No | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | 409.3 | 8.89E+04 | 266.8 | \* |
| ems.C.223 | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | 397.3 | 5.92E+04 | 267.1 | \* |
| ems.C.224 | Yes | No | No | No | No | No | Yes | Yes | Yes | No | Yes | 358.9 | 3.15E+02 | 294.4 | \* |
| ems.C.225 | Yes | Yes | No | No | No | No | Yes | Yes | Yes | No | Yes | 353.4 | 3.02E+02 | 286.3 | \* |
| ems.C.226 | Yes | No | Yes | No | No | No | Yes | Yes | Yes | Yes | Yes | 452.9 | 2.95E+02 | 288.2 | \* |
| ems.C.227 | Yes | Yes | Yes | No | No | No | Yes | Yes | Yes | Yes | Yes | 390.4 | 2.87E+02 | 283.4 | \* |
| ems.C.228 | Yes | No | No | Yes | No | No | Yes | Yes | Yes | No | Yes | 573.4 | 3.39E+02 | 271.2 | \* |
| ems.C.229 | Yes | Yes | No | Yes | No | No | Yes | Yes | Yes | No | Yes | 582.0 | 3.22E+02 | 270.1 | \* |
| ems.C.230 | Yes | No | Yes | Yes | No | No | Yes | Yes | Yes | Yes | Yes | 524.4 | 3.29E+02 | 264.1 | \* |
| ems.C.231 | Yes | Yes | Yes | Yes | No | No | Yes | Yes | Yes | Yes | Yes | 531.4 | 3.07E+02 | 261.7 | \* |
| ems.C.232 | Yes | No | No | No | Yes | No | Yes | Yes | Yes | No | Yes | 339.8 | 5.12E+02 | 286.2 | \* |
| ems.C.233 | Yes | Yes | No | No | Yes | No | Yes | Yes | Yes | No | Yes | 339.1 | 2.83E+02 | 280.9 | \* |
| ems.C.234 | Yes | No | Yes | No | Yes | No | Yes | Yes | Yes | Yes | Yes | 346.7 | 3.37E+02 | 272.7 | \* |
| ems.C.235 | Yes | Yes | Yes | No | Yes | No | Yes | Yes | Yes | Yes | Yes | 338.7 | 3.38E+02 | 269.6 | \* |
| ems.C.236 | Yes | No | No | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | 379.1 | 2.98E+02 | 275.3 | \* |
| ems.C.237 | Yes | Yes | No | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | 374.8 | 2.95E+02 | 268.7 | \* |
| ems.C.238 | Yes | No | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | 415.3 | 3.48E+02 | 260.4 | \* |
| ems.C.239 | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | 399.9 | 3.31E+02 | 259.3 | \* |
| ems.C.240 | Yes | No | No | No | No | Yes | Yes | Yes | Yes | No | Yes | 355.7 | 3.37E+02 | 287.2 | \* |
| ems.C.241 | Yes | Yes | No | No | No | Yes | Yes | Yes | Yes | No | Yes | 355.2 | 2.96E+02 | 285.9 | \* |
| ems.C.242 | Yes | No | Yes | No | No | Yes | Yes | Yes | Yes | Yes | Yes | 938.3 | 3.07E+02 | 287.6 | \* |
| ems.C.243 | Yes | Yes | Yes | No | No | Yes | Yes | Yes | Yes | Yes | Yes | 541.4 | 2.95E+02 | 282.8 | \* |
| ems.C.244 | Yes | No | No | Yes | No | Yes | Yes | Yes | Yes | No | Yes | 550.4 | 3.37E+02 | 272.1 | \* |
| ems.C.245 | Yes | Yes | No | Yes | No | Yes | Yes | Yes | Yes | No | Yes | 555.2 | 3.16E+02 | 271.0 | \* |
| ems.C.246 | Yes | No | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | 484.4 | 3.30E+02 | 265.6 | \* |
| ems.C.247 | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | 485.8 | 3.11E+02 | 263.2 | \* |
| ems.C.248 | Yes | No | No | No | Yes | Yes | Yes | Yes | Yes | No | Yes | 341.1 | 5.62E+02 | 282.9 | \* |
| ems.C.249 | Yes | Yes | No | No | Yes | Yes | Yes | Yes | Yes | No | Yes | 340.6 | 2.90E+02 | 278.8 | \* |
| ems.C.250 | Yes | No | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 373.1 | 3.48E+02 | 274.4 | \* |
| ems.C.251 | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 340.9 | 3.42E+02 | 269.2 | \* |
| ems.C.252 | Yes | No | No | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | 385.3 | 3.08E+02 | 274.8 | \* |
| ems.C.253 | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 385.4 | 3.02E+02 | 269.7 | \* |
| ems.C.254 | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 412.2 | 3.55E+02 | 262.5 | \* |
| ems.C.255 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 400.2 | 3.38E+02 | 261.4 | \* |

\* The Long and Cluster versions fail for this model for important sub groups.