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National Institute of Justice Final Technical Report

Exploring Elder Financial Exploitation Victimization: Identifying Unique Risk Profiles and Factors to Enhance Detection, Prevention and Intervention

Grant # 2013-IJ-CX-0050

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The authors are currently preparing a manuscript, describing the primary findings, which will be submitted to the American Journal of Public Health. Other peer-reviewed journals of interest for further dissemination of relevant findings such as understanding the association between FE types and recidivism and different combinations of FE include the Journal of the American Geriatrics Society, the Gerontologist and Psychology of Violence.

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Abstract

Statement of Purpose: Explore risk factors across the socioecological framework (i.e. individual, perpetrator and community-levels) to identify the most important factors that differentiate elder financial exploitation (FE) from other forms of abuse as well as pure FE from hybrid FE. **Description of Research Subjects:** Older adults 65 years and older with a confirmed case of abuse (i.e. financial exploitation, caregiver neglect, physical abuse, emotional abuse) by Texas Adult Protective Services between the years 2009 – 2014. **Methods:** Secondary data analysis of a 5-year statewide aggregated cohort of Texas Adult Protective Services confirmed cases of abuse between the years 2009 – 2014. Case investigation data such as demographics, reported and confirmed abuse types, victim and perpetrator mental and physical health, substance use, social and financial factors along with community-level data (Geographic Information Systems) were analyzed. Supervised Learning, which provides a step-by-step statistical decision-making process was used to identify the most reliable, interpretive and predictive risk factor models. Training and test sampling was included for replication purposes. **Results:** Financially-based variables are the best predictors of FE versus other forms of abuse, but apparent injury appears to be the most important indicator of other forms of abuse even in the presence of FE. Hybrid FE may be strongly related to poorer outcomes compared to pure FE however, the most predictive model found negative effects of others, alcohol and substance use by others as well as foreclosure and inadequate medical supplies to be the most important predictors of hybrid FE. Models that accounted for less linearity between the variables resulted in greater accuracy in group

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classification indicating the need to account for complex interactions across the socioecological context. **Conclusion:** Different factors across the socioecological context are needed to reliably differentiate between elder FE and other forms of abuse as well as pure versus hybrid FE. These factors will also vary depending on the perspective one takes regarding the linearity of the interactions between the different factors. The findings provide support for the need to differentiate between types of abuse and subtypes of elder FE and the need for frontline workers and social service agencies and researchers to account for variables across the socioecological context when developing surveillance, intervention and prevention programs.

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Executive Summary

Financial exploitation (FE) in older adults is the "illegal taking, misuse or concealment of funds, property or assets of a vulnerable elder" (National Center on Elder Abuse: https://ncea.acl.gov/faq/index.html#faq1) and poses a serious public health problem. In two US national prevalence studies, FE represented the highest percent (5.2%) of self-reported abuse among cognitively intact community-dwelling older adults (Acierno et al., 2010) and occurred in 21% of all cases reported to Adult Protective Services (APS) (Teaster et al., 2006). The estimated financial loss among older Americans in 2012, as a result of FE, was 2.9 billion (MetLife, 2012). Other outcomes include financial ruin (Dessin, 2000), loss of independence and security (Choi et al., 1999), decline in quality of life (Coker, 1997), decreased resources for health care (Kemp et al., 2005), depression and suicide (Nerenberg, 2000; Podneiks, 1992), emergency room visits and hospital admissions (Dong et al, 2013; Dong et al., 2013) and increased risk of 5-year all-cause mortality (Burnett et al., 2016).

Individual studies have found that victim characteristics associated with increased risk of FE include impaired activities of daily living and dependence on others for care, (Peterson et al, 2014; Acierno et al., 2010; Amstadter et al., 2011), not having a spouse (Laumann et al., 2008) reporting poor self-rated health (Amstadter et al., 2011) and non-use of social services (Acierno et al., 2010). Culturally and ethnically relevant victim characteristics such as being African-American or Non-White (Peterson et al., 2014; Amstadter et al., 2011; Laumann et al. 2008) have also been linked to higher risks. Highly probable perpetrators commonly depend on the older adult for finances (Hafemeister, 2003), abuse substances (Anetzberger, 1994) and are chronically unemployed (Jackson and Hafemeister, 2012). Likewise, increasing the number of non-spousal household members, living below the poverty threshold, and perceiving social support to be low

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(Peterson et al., 2014; Amstadter et al., 2011) also appear to be associated with increased incidents of FE victimization.

Adding complexity, recent evidence by Jackson and Hafemeister, (2012) suggests that FE should be considered a construct with two unique subtypes (i.e. Hybrid FE and Pure FE). Hybrid FE consists of FE victimization plus physical abuse and/or neglect and was associated with higher percentages of victims reporting fair/poor health and fear of the abuser. The perpetrators were also more likely to be a relative, chronically unemployed and financially dependent on the older adult. Cohabitation and change in living arrangement from living alone to living with the perpetrator were also associated with HFE versus Pure FE (i.e. no other forms of abuse or neglect). Moreover, HFE victims suffered abuse longer and experienced a 2-fold higher financial loss over the course of the victimization.

These studies provide evidence that factors associated with incidents of FE cut across multiple levels of the socio-ecological context and that unique sets of factors are associated more so with specific subtypes of FE. These findings could have important implications for intervention and prevention programs. These efforts could be further facilitated by attempting to understand the interactions between variables within and across the socioecological context that influence the risk for FE or a specific subtype of FE. Because these interactions are not always linear and instead are likely highly complex and require a tremendous amount of statistical computation, it is often difficult to identify replicable models for identifying and classifying events as multifaceted as elder abuse and FE victimization. Modeling the complexity of the interactions within large datasets can be cumbersome and poses data analytic challenges based on sample size, variable load and the ways in which the variables work together to influence the risk of an outcome. Nevertheless, large APS derived datasets provide good sources of case relevant data regarding victim, perpetrator and

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environmental characteristics and good opportunity for using commonly collected socio-ecological data to determine which factors together can be used to most accurately classify victims of elder FE victimization. Utilizing sophisticated analytic approaches designed to handle such large datasets and complex variable interactions across multiple levels could move corroborate and move the field beyond what has been learned from previous risk factor model building strategies for both FE and its subtypes and provide evidence supporting the use of socio-ecological models when studying elder FE.

Building upon the previous elder FE work, the current study utilizes five years of statewide APS confirmed abuse cases to identify variables of highest importance across the socio-ecological model for accurately distinguishing and classifying elder maltreatment victims as 1): FE versus other forms of abuse and 2): Pure FE vs Hybrid FE. Findings from multiple analytic models varying from the most interpretive to the most predictive will be reported to address these aims. Implications for using a socio-ecological perspective to study elder FE victimization and its subtypes as well as the utility of supervised learning algorithms to improve public health FE victim surveillance and prevention will be discussed.

Methods

Sample

APS are state agencies charged with investigating reports of abuse, neglect and exploitation in adults 18 years of age and older. These agencies perform investigations that include in-depth data collection capturing victim, perpetrator and environmental details needed to substantiate or fail to substantiate an allegation of abuse, neglect and/or exploitation. The data used to conduct this secondary analysis were obtained from the Texas Department of Family and Protective Services, Division of Adult Protective Services (APS). The data provided by APS for the current

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study represent Texas statewide confirmed cases of elder abuse within the years of 2009 – 2014. Only records for adults 65 years and older were included. The confirmed abuse types included financial exploitation, physical abuse, emotional/verbal abuse (i.e. psychological abuse) and caregiver neglect. Caregiver neglect consisted of any of the physical, medical and mental health neglects where a perpetrator, other than the victim, was identified and confirmed.

Definitions of Abuse

The Texas Human Resource code Section 48.002 [a] defines the different types of elder abuse investigated by Texas APS (Texas Department of Family and Protective Services, May 2010). For purposes of this study, these include: (a) emotional/verbal abuse—"any use of verbal communication or other behavior to humiliate, intimidate, vilify, degrade, or threaten harm"; (b) physical abuse —"abuse with resulting physical or emotional harm or pain to an elderly person or adult with a disability by the person's caretaker, family member, or other individual who has an ongoing relationship with the person"; (c) caregiver neglect—"the failure of a caretaker to provide the goods and/or services, including medical, physical or mental health to meet the needs of the older adult" (d) financial exploitation—"the illegal or improper act or process of a caretaker, family member, or other individual who has an ongoing relationship with a person age 65 or older or an adult with a disability."

Given the specific aims of this study and because FE can co-occur with other forms of abuse, we chose to define FE in three ways: 1) FE with or without other forms of abuse, 2) Pure FE –only confirmed FE and no other confirmed forms of abuse and 3) FE with other confirmed forms of abuse.

Demographic Characteristics

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As part of the APS assessment, standard demographic variables were collected for both the alleged victims and perpetrators, when necessary. These variables include age, race/ethnicity, gender and living status. Race/ethnicity classification followed the coding provided by the United States Department of Health and Human Services. Other descriptive characteristics, including, but not limited to cognitive status, mobility, drug abuse and hearing impairments were included. A full list of these additional descriptive variables which are collected and recorded during the APS investigation in conjunction with the Client Assessment and Risk Evaluation variables are included in Appendix A.

Risk Assessment and Contextual Variables

All Texas APS referred cases of elder abuse receive an in-home investigation by an APS caseworker. These investigations include a comprehensive risk assessment guided by the Client Assessment and Risk Evaluation (CARE) tool. The CARE tool is used in conjunction with ancillary data assessment questions to help confirm elder abuse incidents. This tool was initially developed by the Texas Department of Family and Regulatory Services, Division of Adult Protective Services and the Texas Health and Human Services to improve the assessment and service delivery process for cases of mistreatment and self-neglect. Each APS caseworker receives extensive field and manual based training (i.e. 6 weeks) on how to properly administer and record data using the CARE tool. The CARE tool demonstrated efficiency and comprehensiveness when field tested on adults 60 years of age and older.

The CARE tool consists of 57 items assessing the presence and absence of risks for harm associated with the different types of elder mistreatment (i.e. verbal abuse, physical abuse, psychological abuse, financial exploitation etc.) and self-neglect. These items are clustered in into 5 broad categories (i.e. living conditions, financial status, physical/medical status, mental status,

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social interaction) with 15 subcategories. The subcategories contain different risk indicators related to the different types of elder mistreatment and self-neglect. Each risk indicator follows an ordinal scale of measurement with the available response options of no problem, managed risk, problem, severe problem, not applicable and unable to determine. Each level of risk has a descriptive phrase to help the assessor decide on its appropriateness for the given client. A validated allegation is indicated by the identification of a problem or severe problem in any category.

A recent study conducted by Burnett et al. (2014) investigated the construct validity and measurement invariance of the CARE tool. The findings validated the 5-factor structural model, but resulted in the removal of 14 items. The new 5-factor model was cross-validated on a randomly allocated hold-out sample and also showed adequate factor and item-threshold invariance across gender and ethnicity. Because the CARE tool was only validated using data from one region in Texas, the full CARE tool was utilized in this study. The CARE tool can be found in Appendix B.

U.S Census Data and Geographic Information Systems

The US Census Data for the years 2009 – 2014 were used in conjunction with Geographic Information Systems to identify community-level risk and protective factors associated with elder FE. Some of the community-level variables to be assessed are located in Appendix A. Geographic information systems (GIS) are computer systems designed to collect, manage, manipulate, overlay, analyze, and visualize spatial and non-spatial data (Steinberg & Steinberg, 2007). GIS makes it possible to link personal attributes or circumstances (e.g. health, demographic information, and financial exploitation) with features situated in space, which can then be analyzed for spatial patterns or graphed on a map. Public health researchers have used GIS to gain a better understanding of how environmental factors contribute to specific diseases and outcomes as well

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as to develop targeted service plans. However, to date, GIS remains underutilized in the literature (Hirshorn & Stewart, 2003) and to the best of our knowledge, few studies have utilized GIS as a tool to study the issue of elder abuse and specifically, FE (e.g. Payne & Gainey, 2009) despite its evidence-based use in examining patterns of child mistreatment (Ernst, 2000). A list of these variables can be found in Appendix A.

Analytic Strategy

Standard data cleaning techniques described by Tabachnick and Fidell (2001) were used to review the data for missing variables and values as well as out of range values based on each variable. Missing data were assessed and in instances where missingness accounted for more than 10% and a sensitivity analysis was conducted to permit evaluation of the robustness of findings to missing data assumptions. These cleaning methods resulted in a final dataset used for subsequent analyses.

Data Mining Overview

The present study used data mining to examine financial elder abuse. Data mining is a broad term for the process of detecting previously unknown patterns from data (Witten, Frank, & Hall, 2011). Other related (and sometimes interchangeable) words for data mining include machine learning and statistical learning (Hastie, Tibshirani, & Friedman, 2009). Data mining algorithms are used for prediction and knowledge discovery (insight into relationships underlying data). There are myriad different algorithms for use in data mining, and no one algorithm is best for every data set (e.g., James, Witten, Hastie, & Tibshirani, 2013). Further, algorithms vary in their levels of interpretability and raw predictive power; that is, given a set of raw input, some algorithms may provide excellent predictive performance through “black box,” opaque inner workings.

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Generally speaking, data mining algorithms work by tuning on a "training" set of data and predicting outcomes on a "test" set of data. Optimally, these data sets are collected independently. However, in practical situations, researchers often have one data set that must be split into sections for training and testing. Several different methods for data splitting have been proposed and used for data mining (for a review, see Kuhn & Johnson, 2013). The present study uses a two-way random split for training and testing of 80% and 20%, respectively, stratified by a binary outcome to ensure adequate representation of both categories in both splits. Of key importance is that after splitting, the test set is completely held out and never used for training.

There are three major types of data mining algorithms: classification, regression, and clustering. Classification and regression algorithms are considered "supervised learning" in that they attempt to predict observations on an outcome variable of interest; the difference is that classification examines categorical or binary outcomes, while regression investigates continuous outcomes. Clustering algorithms are considered "unsupervised learning" where instead of predicting an outcome, the algorithms seek to find underlying structure within the data. The present study will focus on classification, as the outcome in question (elder abuse type) is categorical.

Many data mining algorithms, including those used in the present study, feature hyperparameters: algorithmic constants that work as tuning knobs, whereby several different values are tested to optimize performance. For example, in penalized regression, the magnitude of shrinkage is governed by a hyperparameter that ranges between 0 and 1 called *lambda*; the closer this value is to zero, the more a model resembles traditional ordinary least squares (OLS) regression (e.g, at lambda = 0, there is no shrinkage).

Model tuning, including hyperparameter optimization, requires resampling procedures within the training set. This may be accomplished in several ways (Kuhn & Johnson, 2013); in the

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present study, this was realized using a technique called 10-fold cross-validation. This procedure involves a ten-way split of the data, whereby 9/10 of the data and 1/10 of the data are selected in turns to serve as sub-training and sub-test sets. Using this procedure, we can minimize the variance in prediction (i.e., reduce the probability of poorly tuned algorithms that may result from lucky/unlucky splits of the data).

In the present study, hyperparameters were tuned by randomly searching a grid space of potential hyperparameter values, testing different values, and choosing the best fitting algorithm of each type based on a scoring criteria. Several scoring criteria are typically available for this purpose; here, the squared difference between predicted and observed values (mean squared error; MSE) is used.

Data Mining

The present study used the open-source software H2O (Aiello, Kraljevic, & Maj, 2016) scripted in the R statistical computing environment (R Core Team, 2016) and implemented in Java to compare the performance of four data mining/machine learning algorithms in classifying different types of elder abuse. H2O provided excellent tools for addressing the research problem: cutting-edge implementations of some of the most powerful algorithms (generalized linear modeling, random forests, gradient boosting machines, and deep learning), parallel processing capabilities to optimize computational resources, and the capacity to scale for use in small and large datasets alike, including “big” datasets (here, the present data included more than 150,000 observations).

Elder abuse in the present study comprised four categorizations: pure financial abuse, hybrid financial abuse, other abuse, and no confirmed abuse. These categories were re-classified into pairs for separate analyses to address specific research questions as follows:

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(1) Given that we have evidence of abuse, can we discriminate between other confirmed abuse (i.e. physical, caregiver and psychological) and financial exploitation?

(2) Given that we have evidence of financial exploitation, can we differentiate between confirmed pure FE and confirmed hybrid FE?

This sequential questioning process was developed for two reasons. First, in a practical sense, many machine learning algorithms are not well-equipped for classification with more than two categories. The present approach affords the flexibility to use a wider range of algorithms while simultaneously fine-tuning our exploration of the data. Second, the process mirrors the manner in which an investigator may approach a novel instance of potential financial elder abuse in the field: they would first assess the probability of any elder abuse, then proceed to discern evidence for financial abuse, and finally determine whether that abuse was purely financial or multi-faceted.

Data mining in the present study utilized four algorithms: penalized generalized linear modeling, random forest, gradient boosting machines, and deep learning. Details of each algorithm follow. Missing data on continuous predictors was handled natively within each algorithm; however, categorical missingness was addressed by creating a unique category for each variable that encapsulated all of the missing observations.

Generalized Linear Modeling (GLM). The most general form of a linear model, GLMs can be considered a type of data mining algorithm in their ability to predict an outcome using a set of inputs (predictors). The most basic form of a GLM is simple linear regression with one predictor and one normally-distributed outcome; however, the model may be extended to situations with many predictors and non-Gaussian outcomes, as in logistic regression.

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The GLM as implemented in H2O (Nykodym, Kraljevic, Hussami, Rao, & Wang, 2016) is further extended to include regularization in the form of an elastic net, a type of shrinkage and variable selection penalty that mixes ridge regression and the lasso (Hastie, Tibshirani, & Friedman, 2009). The elastic net requires two hyperparameters: (1) lambda, the magnitude of the shrinkage penalty to the coefficients, and (2) alpha, the degree of mixing between ridge regression and lasso. The elastic net GLM provides an interpretable equation to describe the relationship between outcome and predictor(s) that is often familiar even to non-statisticians. The algorithm here handles missing continuous data by mean imputation, and variable importance is ranked by the highest magnitude (absolute value) of the regression coefficients.

Random Forest (RF). The random forest was originally developed by Breiman (2001) by creating an ensemble of decision trees across bootstrapped resamples of data with random selection among a subset of predictors. A single decision tree is a simple data mining algorithm in its own right that iteratively partitions a data set by splitting on the variable that may best discriminate an outcome. At each stage, the decision tree selects the best possible variable for splitting without regard to how future splits may be influenced. This constitutes a "greedy" approach that is susceptible to high variance.

The random forest improves on the decision tree in two notable ways: (1) variance is reduced by averaging across many trees and (2) splitting at any given tree node only uses a random subset of predictors, effectively decorrelating the trees in the forest. The algorithm may also internally handle missing data by allowing splits for missing values. Random forests are governed by three primary hyperparameters (although others may be included): the number of trees in the forest, the depth of each tree (the total number of splits a given tree may make), and *mtry*, the number of randomly-chosen variables to consider at each split. Random forest variable importance

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is calculated by randomly permuting the values of each predictor; to the extent that the performance of the algorithm changes, the variable may be considered important.

Gradient Boosting Machine (GBM). Similar to the random forest, the GBM (Friedman, 2001, 2002) builds a strong prediction model from an ensemble of weaker models (here, decision trees, although other types of models may be used). However, rather than building a collection of trees on resampled data sets, boosted models are built sequentially by (1) fitting an initial model (a decision tree), then (2) fitting a new decision tree to the residuals of the initial model and adding it to the fitted first model (with a shrinkage penalty) to update the residuals. This process is repeated over several iterations, constantly updating residuals, to find ways to fit the hardest-to-learn observations. This algorithm as implemented in H2O (Click, Malohlava, Candel, Roark, & Parmar, 2016) handles missing data similarly to the random forest, and is governed by several hyperparameters including the shrinkage rate *lambda* (on average, slower learning algorithms perform better, but may be more computationally expensive), the number of trees to fit, and the depth of the trees. Variable importance is also provided by the algorithm in terms of absolute and relative prediction strength of each input variable.

Deep Learning (DL). Deep learning, implemented in H2O as a novel version of the neural network (Candel, Parmar, LeDell, & Arora, 2016) builds a model of weighted nonlinear relationships between nodes called neurons (mimicking the brain structure) by conceiving one or more hidden layers between a set of inputs and an outcome. The weights of each linked neuron adapt to minimize error in training data. Deep learning algorithms are particularly useful for speech and image recognition tasks. Hyperparameters include values for regularization, the number of hidden layers, the number of nodes within each hidden layer, and others. Missingness on

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continuous variables is handled via mean imputation, and variable importance is calculated by examining the weights of the first two layers of the network.

Data Mining Model Evaluation

After tuning each algorithm using a random grid search to optimize hyperparameter values, variable importance metrics were collected, and the best algorithm of each type was evaluated on the test set. This evaluation yields a predicted probability for each classification for each algorithm; for example, when comparing hybrid versus pure financial elder abuse, each of the best-tuned generalized linear models, random forests, gradient boosting machines, and deep learning models provided a probability between 0 and 1 of a test set observation being a "pure" or a "hybrid" case of financial elder abuse.

These predicted probabilities require further investigation. The naïve investigative principal would be to determine classification of outcomes based on a predicted probability of 0.5 or greater; that is, if an observation is at least 50% likely to be a given classification (e.g., pure), then that observation would be labelled thusly. However, this threshold does not always optimize classification in a practical sense. First, it does not optimize accuracy itself: one may have a larger percentage of correct classification into either group using a different threshold. Second, correct classifications and incorrect classifications may not be equally important. One commonly-used threshold is the F_1 value: the harmonic mean between sensitivity (true positive rate) and precision (ratio of observations correctly classified to the number of observations predicted for a given category). By default, H2O will provide the optimized threshold to maximize F_1 and report a contingency table based thereon. However, given that correct and incorrect predictions may have different costs, researchers should still examine and discern the cutoff that best optimizes the costs inherent to a given research problem. In addition to finding an optimal metric for classifying

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observations into categories, the area under the receiver operating characteristic curve (AUROC, or more commonly AUC) provides a general idea of model discrimination performance. The ROC curve plots true positives against false positives and the closer to 1.0, the better.

A final note about model evaluation bears note: the model with the best predictive power/best discrimination of the outcome may also be the most difficult to interpret. The GLM is the most readily interpretable algorithm in every case: parameter coefficients describe the magnitude and direction of influence for each variable in the model. The random forest, gradient boosting machine, and deep learning algorithms provide variable importance metrics, but as noted these are generally "black boxes" and determining the direction of influence is nebulous. Stacked ensembles are even more difficult to interpret: these provide raw predictive power, and the only interpretable output is the individual contribution of the constituent algorithms from the tuning process (e.g., each algorithm has a different weight).

Modeling Decisions

The approach taken for this analysis was to each individual's first case of substantiation to define their type of abuse. This decision was made for two reasons. First individuals could be in the system multiple times and thus, using the first date of substantiation reduced the need for randomly selecting which case to use. Second, because these data derive from APS cases, recidivistic cases may confer more information than first time cases and thus, might need to be weighted differently because an investigator may know more about the case due to prior known information and thus, may validate the case based on this information. This could affect the ability to identify important risk factors and characteristics associated with the outcome. We also modeled the data using a variety of approaches within the supervised learning program. This allows us to identify the most robust and accurate model given the data.

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Results

Because recidivism may play a unique role in the level of known information about a case (i.e. assessor may have more information on previously investigated cases than on initial investigations) and thus adding an unequal prediction weight, we chose to truncate the analysis to include only the first episode of confirmed abuse. The total count for the confirmed elder abuse cases between the years 2009 and 2014 was N = 8,800. A total of N = 2514 or (29%) of the confirmed elder abuse cases over the 5-years include FE. A total of N=1964 (78%) had substantiated FE only (i.e. Pure FE) and N = 550 had FE plus some other form(s) of abuse (i.e. Hybrid FE), excluding self-neglect. Tables 1-4 describe the victim and perpetrator demographics as well as cognitive, functional and substance abuse characteristics that are collected as part of the routine APS investigation in addition to the CARE tool variables.

For brevity, only the main results pertaining to the specific aims are provided in the narrative. Two sets of results are presented to balance interpretation and predictive accuracy of the models used to address the specific aims. These models include the General Linear Model (GLM) for interpretation and the Gradient Boosting Machine (GBM) for predictive and classification accuracy. Tables 5-10 provide the details regarding the GLM and GBM findings when trying to differentiate between confirmed FE and other forms of confirmed abuse and confirmed pure FE versus confirmed Hybrid FE. Receiver operating curves for all algorithms presented below can be found in Figures 1-4 located in the Appendix.

Beginning with the most interpretative model, 4 of the top 10 most important variables for differentiating confirmed FE versus other forms of confirmed abuse included financial based questions (Table 5). Interestingly, the second most important variable in the model was apparent injuries which predicted other forms of abuse. Three of the last 5 most important variables are

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related to caregiver neglect issues such as stress and burnout, knowledge and ability and physical neglect of the older adult. Differentiating characteristics of the perpetrator include being a spouse and older than 65 years of age; both of which are protective against FE. While area under the curve (AUC) for classifying confirmed FE versus other confirmed abuse cases was good (0.97), this model had the highest mean square error (MSE) rate (0.059) indicating less classification reliability compared to the other models (Table 6).

[Insert Table 5 & 6]

These AUC (0.799) and the MSE (0.125) worsen when trying to differentiate confirmed pure FE from confirmed hybrid FE (Table 8). Likewise, the variables of importance changed with no financial based questions making the top 10 list and the addition of other variables including inadequate medical supplies, foreclosure and evictions, restricted autonomy, inadequate food supply and alcohol and drug use by others in the home (Table 7).

[Insert Table 7 & 8]

The GBM sacrifices interpretative detail to maximize predictive accuracy. Table 9 provides the top 10 variables of importance for differentiating confirmed FE from other confirmed types of abuse. This model, like the GLM model found 3 financial questions to be within the top 4 most important variables for classification. Unauthorized use of the victim's income/assets by others was the most important variable from which other variables were scaled in relation to this variable. While other variables are included in the top 10, their scaled importance is quite limited dropping to less than 10% contribution to the group prediction beginning with perpetrator relationship identified as other. The model AUC and MSE were 0.972 and 0.053, respectively (Table 6).

[Insert Table 9]

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Differentiating confirmed pure FE versus confirmed Hybrid FE provided a set of top 10 variables which individually contributed more in comparison to the model found in Table 10. Table 10 identified a different set of variables with APS region where the allegation was substantiated being the top variable of importance for differentiating the group. In this model, it is also determined that the variables related to negative effects of others, alcohol and drug use by others in the home, facing foreclosure and inadequate medical supplies were ranked the highest in importance for predicting pure FE. Interestingly, the only financial-based question included in the top 10 was evidence of substantial unusual activity with the client's financials or assets by other(s). The AUC and MSE for this model 0.831 and 0.123, respectively (Table 8).

[Insert Table 10]

Discussion

This study utilized a large statewide dataset of confirmed elder abuse cases to form data-driven risk factor models that differentiate elder FE from other types of abuse and pure FE from hybrid FE. These models were developed using machine learning algorithms capable of handling very large aggregated datasets in which it is suspected that victim level, perpetrator level and community-level data interact in myriad unspecified ways to increase or decrease the risk of the outcome. Seeking to balance interpretative model building with predictive accuracy model building we found parallels with earlier research (Jackson & Hafemesiter, 2012), but also identified new factors, across multiple levels of the socioecological context, to be considered when trying to differentiate other forms of abuse from FE and when trying to differentiate pure vs hybrid FE.

To create the context in which our findings should be considered, we first present a few study limitations. Although this was a large dataset of confirmed elder abuse cases over a five-

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year timeframe, the data represented case findings from a single APS organization. It is understood that APS agencies across the country may have different statutes, definitions and investigation techniques thus, reducing the generalizability of the findings and the use of the data algorithms available for predicting the outcomes. Also, the APS organization from which these data were derived only investigates FE that occurs within a trusted relationship between the victim and perpetrator. Thus, financial scams and most cases of fraud were not included. Moreover, only elder abuse cases were included in the analysis, therefore excluding self-neglect which could also be important for understanding the risks of being financially exploited (Dong et al., 2013). Crime data at the community-level were not included due to little comparable and available data across the counties. This information could be highly useful for identifying locations where public service announcements may have the highest impact for prevention and intervention. Finally, due to truncating the data analysis to the first confirmed case of abuse, recidivism was not included as a risk factor despite its potential importance in differentiating types of abuse (Jackson and Hafemeister, 2012).

Differentiating FE from other forms of abuse resulted in a few variables of importance that were not altogether unsuspected. It was no surprise that three of the top four most important variables in both the GLM and GBM models were financially focused given that evidence of these would indicate some sort of financial exploitation attempt. Nor was it of great surprise that caregiver stress and burnout, knowledge and willingness to care for the client were more predictive of other forms of abuse since these conditions have been linked both theoretically and empirically to poor provision of medical and physical care (Reis & Namiash, 2008). It was also found in this model that spousal perpetrators and those 65 years of age and older were more likely to be associated with other forms of abuse. This finding fits with previous research and suggests that

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when FE is involved perpetrators outside of these characteristics (i.e. adult children, grandchildren, neighbors) should be considered as more probable (Jackson & Hafemeister, 2012; Hafemeister, 2003).

Interestingly, apparent injury to the client was the second most important variable in the GLM model, outperforming caregiver's management of victim's finances and evidence of substantial unusual activity with the victim's financials by others. In the pure FE versus hybrid FE model, apparent injuries became the variable with the greatest importance for predicting FE status. This indicates that apparent injury is a salient indicator that should be looked for even when FE is the only reported allegation. The presence of an apparent injury during an FE investigation may very well be an indicator of some concurrent form of abuse (i.e. Hybrid FE). Alternatively, when an apparent injury is present it may also indicate the need to concurrently rule out FE as a motive for the injury. Jackson and Hafemeister (2012) found that Hybrid FE victims experienced various forms of abuse which could have manifested as apparent injuries. Another interesting variable that predicted other forms of abuse was thoughts of suicide and self-injury. While previous studies have linked FE to outcomes such as depression and suicide (Nerenberg, 2000; Podnieks, 1992), it appears that in these data, FE victimization was not as strongly associated with these feelings compared to being victimized in other ways. It could also be that the earlier study did not account for the presence of other forms of abuse when assessing the association between FE and depression and suicide therefore, making these distinctions is of underlying importance.

The GLM model differentiating pure FE from hybrid FE should be given more specific consideration. Previous research has found that FE victimization is the least likely form of abuse in older adults to be prosecuted and to receive follow-up from APS caseworkers and other agencies (Jackson and Hafemeister, 2011). A plausible reason for this finding is the lack of attention paid

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to the need for differentiating the types of abuse and making the association with outcomes that impact quality of life. Review of the GLM model, shows that when FE is associated with other forms of abuse a range of quality of life issues are negatively impacted. The older adult may not be receiving their adequate medical supplies due to a lack of funds. They may be facing foreclosure, living with no utilities and inadequate food supplies and in conditions that may be condemnable. Moreover, they may be deprived of one of the most essential conditions of being an adult which is autonomy to make one's own decisions and have one's own purpose. This could account for the previous finding that these older adults are having more thoughts of suicide and self-injury. It is highly plausible that these conditions are the result of longer-term abuse (Jackson and Hafemeister, 2012) and thus, speak to the need for identifying FE and differentiating pure FE from hybrid FE when a case is first investigated.

The GBM model for both differentiating FE from other forms of abuse and pure FE from hybrid FE provided the best classification accuracy. As mentioned above, financially-based questions were of the greatest importance in the differentiating the former. However, it was found that APS region was the fifth most important predictor of FE in this model, but was the first most important in the model predicting pure versus hybrid FE. This may point to regions where public service announcements about financial crimes may benefit older adults living in the areas or point to other community-level variables that were not included such as crime data which are often hard to standardize and obtain in a way that allows comparison across counties. Other highly important variables that predicted pure FE was negative effects of others on the older adult as well as alcohol and drug use by others in the house. While GBM models are less interpretive it is plausible that when victims are more affected by others in the home and when alcohol and drug use by others are present, then pure FE is less likely. Negative effects may be related to any of the other forms

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of abuse including psychological abuse and alcohol and drug abuse by others in the home was predictive of hybrid FE in the earlier GLM model which also fits with literature about perpetrator characteristics. Other variables such as having an ongoing relationship conflict with others and the perpetrator being more likely to be a child also suggest that these variables are predictive of hybrid FE.

This study expanded on the earlier study by Jackson and Hafemeister (2012) which identified victim and perpetrator factors associated with pure FE versus hybrid FE. While different sets of variables were considered based on the available data and the definitions of FE, there was overlap between variables and several of the findings were comparable. These studies provide complementary data for understanding FE and its subtypes. Both studies identified troubling patterns of abuse with the current study point out the importance of apparent injury in differentiating pure versus hybrid FE. Both studies also identified a lack of appropriate medical supervision and inadequate food supplies associated with hybrid FE. While Jackson and Hafemeister reported that a change in living status and longer-term abuse was associated with hybrid FE the current study found that the hybrid FE victims were more likely to be facing was facing foreclosure and eviction which plausibly points to both a future change in living status and longer-term abuse. Moreover, neither study found perpetrator mental health or criminal history to be important predictors, but the current study did find that alcohol and drug use by others in the home was more predictive of hybrid FE.

The current study also expanded on previous research by identifying factors of importance that could help frontline workers differentiate FE from other forms of abuse. Similarly with pure FE versus hybrid FE, these factors emerge across multiple levels of the socioecological context suggesting the need for comprehensive assessments when trying to determine whether FE has

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occurred. Because FE and other forms often occur in highly complex conditions where the change in a single factor, among many, could affect the probability of an outcome such as pure FE versus hybrid FE it is important to be able to identify reliable predictors of the outcome to decrease the likelihood of misclassifying a case which could be detrimental especially if a hybrid FE case is falsely classified as a pure FE case.

To this end, this study utilized a new and unparalleled approach in the field of elder abuse and was able to analyze the many different possible interactions within a large and robust APS dataset to derive the most important variables across the different socioecological levels for predicting FE from other forms of abuse and pure FE from hybrid FE. Such modeling can be used to create replicable data algorithms that can be transformed into web-based applications for immediate broad-based dissemination and use for public health surveillance and program development by social service and criminal justice agencies as well as researchers.

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Table 1: Victim Demographic Characteristics for N = 113561 Adult Protective Services Substantiated Cases of Elder Abuse in Texas Between the Years of 2009 - 2014

	All Confirmed FE	**Confirmed Pure FE**	**Confirmed Hybrid FE**	**Confirmed Other Abuse-No FE**
	N=2514	N=1964	N=550	N=6286
Age				
65-69	331(13.2)	238(12.1)	93(16.9)	1456(23.2)
70-74	397(15.8)	282(14.4)	115(20.9)	1334(21.2)
75-79	462(18.4)	358(18.2)	104(18.9)	1224(19.5)
80-84	565(22.5)	454(23.1)	111(20.2)	1176(18.7)
85-89	475(18.9)	390(19.9)	85(15.5)	731(11.6)
90+	284(11.1)	242(12.3)	42(7.6)	365(5.8)
Gender				
Female	1692(67.3)	1311(66.8)	381(69.3)	4365(69.4)
Male	814(32.4)	648(33.0)	166(30.2)	1908(30.4)
Missing	8(0.30)	5(0.3)	3(0.5)	13(0.2)
Ethnicity				
White	1561(62.1)	1221(62.2)	340(61.8)	3519(56.0)
Black	331(13.2)	247(12.6)	84(15.3)	789(12.6)
Hispanic	423(16.8)	312(15.9)	111(20.2)	1735(27.6)
Other	199(7.9)	184(9.4)	15(2.7)	226(3.6)
Marital				
Married	499(19.8)	380(19.3)	119(21.6)	2532(40.3)
Divorced	159(6.3)	109(5.5)	50(9.1)	405(6.4)
Widowed	851(33.9)	648(33.0)	203(36.9)	1436(22.8)
Separated	16(0.7)	13(0.7)	3(0.5)	58(0.9)
Single	66(2.6)	43(2.2)	23(4.2)	154(2.4)

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Missing	923(36.7)	771(39.3)	152(27.6)	1701(27.1)
Living				
Own home/apt	1706(67.9)	1337(68.1)	369(67.1)	5048(80.3)
Friends/relatives	233(9.3)	173(8.8)	60(10.9)	718(11.4)
Nursing home/assisted living	513(20.4)	404(20.6)	109(19.8)	357(5.7)
Other	61(2.4)	49(2.5)	12(2.2)	152(2.4)
Missing	1(0.1)	1(0.1)	0(0.0)	11(0.2)

FE = Financial Exploitation; **Pure FE** = Financial Exploitation Only Excluding Hybrid Cases; **Hybrid FE** = Financial Exploitation Plus Other Types of Abuse Excluding Pure FE; **Other Abuse** = Caregiver Neglect, Psychological Abuse, Physical Abuse;

Table 2: Victim Impairment and Substance Abuse Characteristics for N = 113561 Adult Protective Services Substantiated Cases of Elder Abuse in Texas Between the Years of 2009 - 2014

	All Confirmed FE	**Confirmed Pure FE**	**Confirmed Hybrid FE**	**Confirmed Other Abuse-No FE**
	N=2514	N=1964	N=550	N=6286
Cognitive Impairment				
N	2178(86.6)	1713(87.2)	465(84.5)	5847(93.0)
Y	336(13.4)	251(12.8)	85(15.5)	439(7.0)
Alcohol abuse				
N	2500(99.4)	1950(99.3)	550(100.0)	6237(99.2)
Y	14(0.6)	14(0.7)	0(0.0)	49(0.8)
Drug abuse				
N	2512(99.9)	1962(99.9)	550(100.0)	6273(99.8)
Y	2(0.1)	2(0.1)	0(0.0)	13(0.2)
Physically disabled				
N	1868(74.3)	1472(74.9)	396(72.0)	4993(79.4)
Y	646(25.7)	492(25.1)	154(28.0)	1293(20.6)

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Mobility impairment				
N	1954(77.7)	1529(77.9)	425(77.3)	5370(85.4)
Y	560(22.3)	435(22.1)	125(22.7)	916(14.6)
Visual Impairment				
N	2423(96.4)	1894(96.4)	529(96.2)	6108(97.2)
Y	91(3.6)	70(3.6)	21(3.8)	178(2.8)
Hearing impairment				
N	2396(95.3)	1879(95.7)	517(94.0)	6102(97.1)
Y	118(4.7)	85(4.3)	33(6.0)	184(2.9)
Limited English				
N	2392(95.1)	1870(95.2)	522(94.9)	5702(90.7)
Y	122(4.9)	94(4.8)	28(5.1)	584(9.3)
Developmental Disability				
N	2510(99.8)	1961(99.8)	549(99.8)	6273(99.8)
Y	4(0.2)	3(0.2)	1(0.2)	13(0.2)

FE = Financial Exploitation; **Pure FE** = Financial Exploitation Only Excluding Hybrid Cases; **Hybrid FE** = Financial Exploitation Plus Other Types of Abuse Excluding Pure FE; **Other Abuse** = Caregiver Neglect, Psychological Abuse, Physical Abuse;

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Table 3: Characteristics for N = 15705 Texas Adult Protective Services Substantiated Perpetrators of Elder Abuse in Between the Years of 2009 - 2014

	All Confirmed FE	**Confirmed Pure FE**	**Confirmed Hybrid FE**	**Confirmed Other Abuse-No FE**
	N=4203	N=3099	N=1104	N=11502
Age				
0-24	404(10)	317(10.2)	87(7.9)	1327(11.5)
25-29	321(8)	264(8.5)	57(5.2)	473(4.1)
30-34	390(9)	298(9.6)	92(8.3)	539(4.7)
35-39	449(11)	336(10.8)	113(10.2)	722(6.3)
40-44	566(13)	409(13.2)	157(14.2)	1042(9.1)
45-49	670(16)	466(15.0)	204(18.5)	1352(11.8)
50-54	589(14)	407(13.1)	182(16.5)	1435(12.5)
55-59	421(10)	300(9.7)	121(11.0)	1044(9.1)
60+	393(9)	302(9.7)	91(8.2)	3568(31.0)
Gender				
Female	2542(60)	2001(64.6)	541(49.0)	5337(46.4)
Male	1674(39)	1075(34.7)	559(50.6)	6127(53.3)
Missing	27(1)	23(0.7)	4(0.4)	38(0.3)
Ethnicity				
White	2070(49)	1448(46.7)	622(56.3)	5934(51.6)
Black	792(19)	604(19.5)	188(17.0)	1591(13.8)
Hispanic	899(21)	665(21.5)	234(21.2)	3287(28.6)
Other	442(11)	382(12.3)	60(5.4)	690(6.0)
Missing	0(0)	0(0.0)	0(0.0)	0(0.0)
Marital				
Married	880(21)	658(21.2)	222(20.1)	3592(31.2)
Divorced	323(8)	215(6.9)	108(9.8)	808(7.0)
Widowed	53(1)	39(1.3)	14(1.3)	184(1.6)
Separated	77(2)	57(1.8)	20(1.8)	234(2.0)
Single	452(11)	301(9.7)	151(13.7)	1674(14.6)
Missing	2418(58)	1829(59.0)	589(53.4)	5010(43.6)
Living				
Own home/apt	2094(50)	1622(52.3)	472(42.8)	5487(47.7)
Friends/relatives	946(23)	593(19.1)	353(32.0)	3312(28.8)
Nursing home/assisted living	4(0.009)	2(0.1)	2(0.2)	157(1.4)
Other	330(8)	226(7.3)	104(9.4)	793(6.9)
Missing	829(20)	656(21.2)	173(15.7)	1753(15.2)

FE = Financial Exploitation; **Pure FE** = Financial Exploitation Only Excluding Hybrid Cases; **Hybrid FE** = Financial Exploitation Plus Other Types of Abuse Excluding Pure FE; **Other Abuse** = Caregiver Neglect, Psychological Abuse, Physical Abuse;

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Table 4: Relationship, Co-habitation and Substance Abuse Characteristics for N = 15705 Texas Adult Protective Services Substantiated Perpetrators of Elder Abuse in Texas Between the Years of 2009 - 2014

	All Confirmed FE	**Confirmed Pure FE**	**Confirmed Hybrid FE**	**Confirmed Other Abuse-No FE**
	N=4203	N=3099	N=1104	N=11502
Relation to victim				
Spouse	81(0.02)	49(1.6)	32(2.9)	2720(23.6)
Daughter	884(21)	595(19.2)	289(26.2)	2466(21.4)
Son	896(21)	537(17.3)	359(32.5)	2962(25.8)
Grandchild	606(14)	445(14.4)	161(14.6)	1558(13.5)
Other Family member	518(12)	387(12.5)	131(11.9)	1137(9.9)
service provider	763(18)	690(22.3)	73(6.6)	350(3.0)
Other	394(9)	346(11.2)	48(4.3)	289(2.5)
Missing	61(1)	50(1.6)	11(1.0)	20(0.2)
Co-reside with victim				
Yes	730(17)	453(14.6)	277(25.1)	5205(45.3)
No	1807(43)	1449(46.8)	358(32.4)	2106(18.3)
Missing	1666(40)	1197(38.6)	469(42.5)	4191(36.4)
Alcohol abuse				
N	4066(97)	3019(97.4)	1047(94.8)	10869(94.5)
Y	137(3)	80(2.6)	57(5.2)	633(5.5)
Drug abuse				
N	3448(92)	2892(93.3)	956(86.6)	10793(93.8)
Y	355(8)	207(6.7)	148(13.4)	709(6.2)

FE = Financial Exploitation; **Pure FE** = Financial Exploitation Only Excluding Hybrid Cases; **Hybrid FE** = Financial Exploitation Plus Other Types of Abuse Excluding Pure FE; **Other Abuse** = Caregiver Neglect, Psychological Abuse, Physical Abuse;

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Table 5: Top 10 Variables by Importance for Predicting Financial Exploitation versus Other Forms of Abuse Using General Linear Model Algorithms

Variable Importance	Interpretation	Predicted Group
1: CARE Item 24	Unauthorized Use of the victims income/assets by others	Financial Exploitation
2: CARE Item 26	Apparent Injuries to Client	Other Forms of Abuse
3: CARE Item 23	Caregivers Management of Victims Finances are Problematic	Financial Exploitation
4: CARE Item 25	Evidence of Substantial Unusual Activity with the Client's Financials or Assets by Other(s)	Financial Exploitation
5: CARE Item 38	Client has Thoughts of Suicide, Homicide or Self-Injury	Other Forms of Abuse
6: CARE Item 55	Caregiver Stress Burnout	Other Forms of Abuse
7: CARE Item 56	Ability, Knowledge and Willingness to Care for the Client	Other Forms of Abuse
8: Perpetrator is the Spouse	The perpetrator is the spouse	Other Forms of Abuse
9: CARE Item 29	Grooming, Hygiene and Cleanliness	Other Forms of Abuse
10: Number of Perpetrators Older than 64 years of age	The perpetrator is 65 years of age or older	Other Forms of Abuse

Table 6: Model Fit for Four Supervised Learning Test-Set Algorithms to Predict Financial Exploitation Versus Other Forms of Abuse using Victim, Perpetrator and Community-Level data

	Mean Squared Error	AUROC
GLM	0.0592	0.9680
RF	0.0574	0.9711
GBM	0.0530	0.9723
RDL	0.0577	0.9681

GLM= General Linear Model; RF = Random Forest; GBM = Gradient Boosting Machine; RDL = Random Deep Learning

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Table 7: Top 10 Variables by Importance for Predicting Pure Financial Exploitation versus Hybrid Financial Exploitation Using General Linear Model Algorithms

Top 10 Variables of Importance	Interpretation	Predicted Group
1: CARE Item 26	Apparent Injuries to Client	Hybrid
2: CARE Item 33	Client has Inadequate Medical Supplies, Medications	Hybrid
3: CARE Item 02	Client Facing Foreclosure, Eviction, Condemnation	Hybrid
4: CARE Item 55	Caregiver Stress Burnout	Hybrid
5: CARE Item 17	Utilities not working	Hybrid
6: CARE Item 49	Restricted Autonomy	Hybrid
7: CARE Item 19	Inadequate Food Supply	Hybrid
8: Ethnicity	Native American	Pure
9: CARE Item 54	Alcohol, Drug Use by Others in the Household	Hybrid
10: CARE Item 03	Conditions attract and Harbor Pests	Hybrid

Table 8: Model Fit for Four Supervised Learning Test-Set Algorithms to Predict Pure Financial Exploitation Versus Hybrid Financial Exploitation using Victim, Perpetrator and Community-Level data

	Mean Squared Error	AUROC
GLM	0.1251	0.7986
RF	0.1255	0.8288
GBM	0.1230	0.8306
RDL	0.1318	0.7626

GLM= General Linear Model; RF = Random Forest; GBM = Gradient Boosting Machine; RDL = Random Deep Learning

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Table 9: Top 10 Variables by Importance for Predicting Financial Exploitation versus Other Forms of Abuse Using on Gradient Boosting Machine Algorithms

Variable	Interpretation	Scaled Importance
1: CARE Item 24	Unauthorized Use of the victims income/assets by others	1.000
2: CARE Item 25	Unusual Financial Activity	0.249
3: CARE Item 23	Caregivers Management of Victims Finances are Problematic	0.104
4: Perpetrator Relationship to Client	Perpetrator relationship is Other	0.058
5: APS-Region	APS Region where Financial Victimization Occurred	0.043
6: Client and Perpetrator Co-habitation	Perpetrator not Cohabitating with Victim	0.036
7: Fiscal Year	Year of Substantiation	0.031
8: CARE Item 50	Client Ongoing Conflict Relationships with Others	0.026
9: Client and Perpetrator Co-habitation	Perpetrator Cohabitating with the Client	0.017
10: Perpetrator Relationship to Client	Perpetrator is or is not the Spouse	0.015

APS = Adult Protective Services; CARE tool = Client Assessment and Risk Evaluation tool

Table 10: Top 10 Variables by Importance for Predicting Pure Financial Exploitation versus Hybrid Financial Exploitation Using on Gradient Boosting Machine Algorithms

Variable	Interpretation	Scaled Importance
1: APS-Region	APS Region where Financial Victimization Occurred	1.000
2: CARE Item 51	Negative Effects of Others Actions on the Client	0.787
3: CARE Item 54	Alcohol, Drug Use by Others in the Household	0.570
4: CARE Item 02	Client Facing Foreclosure, Eviction, Condemnation	0.503
5: CARE Item 33	Client has Inadequate Medical Supplies, Medications	0.458
6: CARE Item 50	Client Ongoing Conflict Relationships with Others	0.399
7: Perpetrator Relationship to Client	Perpetrator Relationship with Victim is Other	0.337
8: Fiscal Year	Year of Substantiation	0.307
9: Perpetrator Relationship to Client	Perpetrator Relationship to the Client is Child	0.268
10: CARE Item 25	Evidence of Substantial Unusual Activity with the Client's Financials or Assets of Other(s)	0.266

APS = Adult Protective Services; CARE tool = Client Assessment and Risk Evaluation tool

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Figure 1. Area Under the Curve for the General Linear Model When Differentiating Confirmed Financial Exploitation from Other Confirmed Types of Abuse

Figure 1: The percent correctly classified by chance is 71.46%. This prediction improved to 96.80% using the GLM algorithm.

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Figure 2. Area Under the Curve for the General Linear Model When Differentiating Confirmed Pure Financial Exploitation from Confirmed Hybrid Financial Exploitation

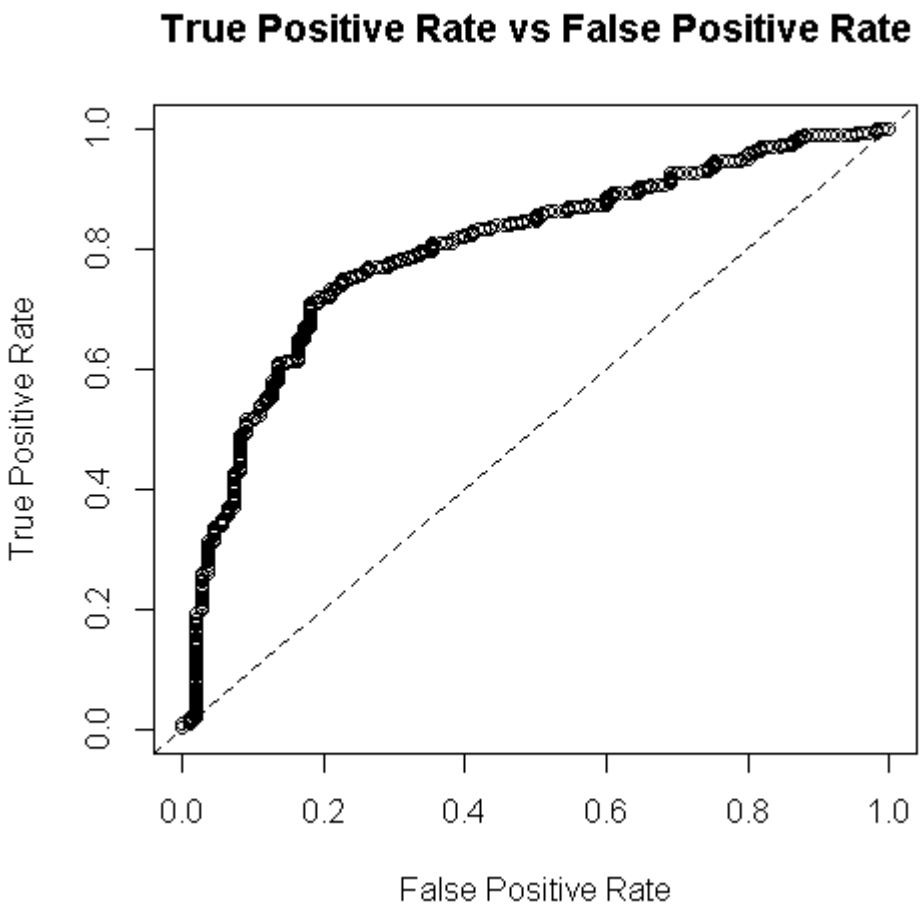

Figure 2: The percent correctly classified by chance is 78.09%. This prediction improved to 79.90% using the GLM algorithm.

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Figure 3. Area Under the Curve for the Gradient Boosting Machine When Differentiating Confirmed Financial Exploitation from Other Confirmed Types of Abuse

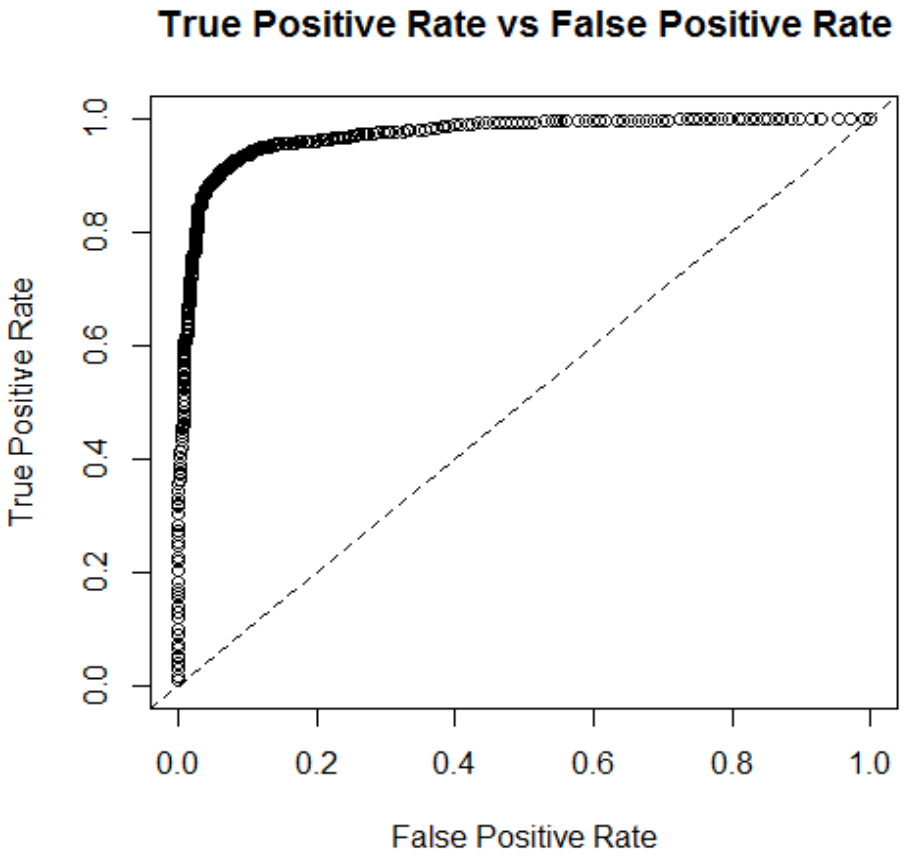

Figure 3: The percent correctly classified by chance is 71.46%. This prediction improved to 97.23% using the GBM algorithm.

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Figure 4. Area Under the Curve for the Gradient Boosting Machine When Differentiating Confirmed Pure Financial Exploitation from Confirmed Hybrid Financial Exploitation

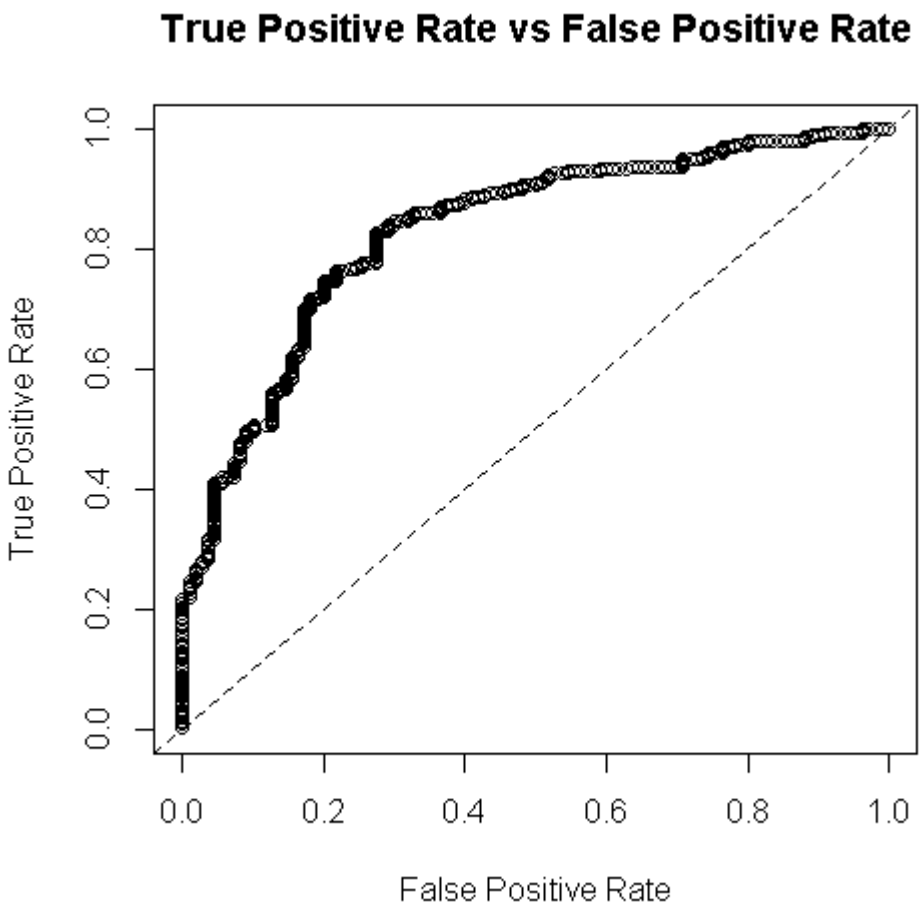

Figure 4: The percent correctly classified by chance is 78.09%. This prediction improved to 83.06% using the GBM algorithm.

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SELF-NEGLECT ABUSE TYPES

In original APS report, there are 8 defined types of abuse:

- EMOTIONAL ABUSE
- EXPLOITATION
- MEDICAL NEGLECT
- MENTAL HEALTH NEGLECT
- PHYSICAL ABUSE
- PHYSICAL NEGLECT
- SUICIDAL THREAT
- SEXUAL ABUSE

Table 1 The following variables are for victims: victim demographics, victim characteristics, CARE tool variables. There are two race/ethnicity variables: "eth_6" is a 6-category variable while "eth_alt" is 4-category.

Variable	Coding	Type(length)
stage	Unique stage ID	Num(8)
id	Unique person ID for victims	Num(8)
gend	Gender ('1'=Female '2' = Male '9'=Unknown)	Char(1)
age	Age in years (group into 5 year range) 0-19 as '0', 20-25 as '20', …, 90+ as 90	Num(3)
eth_6	Ethnicity (6 category) in APS DRIT 72101 '1'=White '2'=Black '3'=Hispanic '4'=Native American '5'=Asian '6'=Other '9'=Unknown	Char(1)
eth_alt	Alternative HHSC grouping (derived from 6 race/ethnicity indicators in APS DRIT 70717) '1'=White '2'=Black '3'=Hispanic '4'=Other '9'=Unknown	Char(1)
living	Categorical variable for living arrangement: '1'=Own Home/Apt '2'=Friends/Relatives '3'=Nursing Home/Assisted Living Facility '4'=Other '9'=Unknown	Char(1)
marital	Categorical variable for Marital status: '1'=Married '2'=Divorced '3'=Widowed	Char(1)

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	'4'=Separated '5'=Single, Never married '9'=Unknown	
**clnt1 - 23*	Client Characteristics for victims ('Y' or 'N')	Char(1)
**care1 - 57*	CARE TOOL items ('Y' or 'N')	Char(1)
Unavail_street	Victim's street address is unavailable ('Y' or 'N')	Char(1)
**zcomm1-44*	Geocoded community level variables (zip resolution) Based on victims' address	Num(8)
**tcomm1-44*	Geocoded community level (census tract resolution) Based on victims' address	Num(8)

**See attached list for numbered variables.*

1 CODING OF VARIABLES RELATED TO ABUSE TYPES (APPLIES TO "VICTIM_ROWS", "VIC_PERP_PAIR", "VIC_FIRST_STAGE")

Table 2 Summary of abuse information for a victim

Variable	Coding	Type(length)
any_cfm	Any confirmed abuse in this episode('Y' or 'N')	Char(1)
any_uncfm	Any un-confirmed abuse in this episode('Y' or 'N')	Char(1)
any_cfm_sn	Any confirmed self-neglect in this episode('Y' or 'N')	Char(1)
any_uncfm_sn	Any un-confirmed self-neglect in this episode('Y' or 'N')	Char(1)
**Ind_cfm1-11*	Indicator for confirmed abuse types per victim ('Y' or 'N')	Char(1)
**Ind_uncfm1-11*	Indicator for unconfirmed abuse types per victim ('Y' or 'N')	Char(1)
fe	Per Case FE status: (P)ure FE, (H)ybrid FE, (O)ther or (N)one	Char(1)

**See attached list for numbered variables.*

2 CODING OF VARIABLES RELATED TO PERPETRATORS (APPLIES TO "PERP_ROWS", "VIC_PERP_PAIR")

Table 3 The following variables are for perpetrators: self-indicator, role, relationship to corresponding victim, demographics, characteristics, abuse types (confirmed), abuse types (unconfirmed).

Variable	Coding	Type(Length)
self	Is perpetrator self to victim('Y' or 'N')	Char(1)
p_role	Role of the perpetrator: 'DP' = 'Designated Perpetrator' 'AP' = 'Alleged Perpetrator' 'VP' = 'Designated Victim/Perpetrator' 'NR' = 'No Role' 'UN' = 'Unknown' 'CL' = 'Client'	char(2)
p_rel	The perpetrator's relationship to the victim:	char(1)

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	'0'=Self '1'=Spouse '2'=Daughter '3'=Son '4'=Grandchild '5'=Other Family member '6'=Service Provider; everything else other than family member. '7'=Other '9'=Unknown	
p_orig_rel	Original "relationship" as in APS report	Char(30)
p_id	Unique person ID for perpetrators	Num(8)
p_gend	Perpetrator gender('1'=Female '2' = Male '9'=Unknown)	Char(1)
p_age	Perpetrator age in years	Num(3)
p_eth_6	Perpetrator ethnicity (same format as victims)	Char(1)
p_eth_alt	Perpetrator alternative ethnicity (same format as victims)	Char(1)
p_living	Perpetrator living arrangement(same format as victims)	Char(1)
p_marital	Perpetrator marital status (same format as victims)	Char(1)
**p_clnt1 – 22*	Perpetrator characteristics (same format as victims)	Char(1)
**type_cfm1– 8*	Indicators for confirmed abuse types ('Y' or 'N'); 'I' means changed from 'Y' due to incompatible type	Char(1)
**type_uncfm1 –8*	Indicators for unconfirmed abuse types ('Y' or 'N'); 'I' means changed from 'Y' due to incompatible type	Char(1)
P_fe	Per perpetrator FE status: (P)ure FE, (H)ybrid FE, (O)ther or (N)one	Char(1)

**See attached list for numbered variables.*

3 OTHER VARIABLES

Table 4 Other variables

Variable	Coding	Type(length)
episode	Stage sequence # for a victim; counting from his/her first stage in APS report	Num(3)
FY	APS fiscal year	Num(3)

4 LIST OF NUMBERED VARIABLES

4.1 CLIENT CHARACTERISTICS (CLNT1-23)

1. AGED: age >=65 (**should be 'Y' for all victims)**)
2. ALCOHOL ABUSE
3. AUTISM
4. CI: Cognitively Impaired

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5. DDD: Developmental Disability-Diagnosed
6. DRUG ABUSE
7. HEARING IMPAIRED
8. HIV AIDS
9. IDD: Intellectual and Developmental Disability
10. LIMITED ENGLISH
11. MDCP CLASS: Receiving MDCP/CLASS
12. MW HCS: Medicaid Waiver: Receiving HCS Services
13. MW WL: Medicaid Waiver: Waiting List
14. MENTAL ILLNESS
15. MILITARY DEPENDENT
16. MOBILITY IMPAIRED
17. PHYSICALLY DISABLED
18. SPEECH DISABLED
19. VISUALLY IMPAIRED
20. UNDETERMINED IMMIGRATION STATUS
21. UNQUALIFIED IMMIGRANT
22. PERMANENT RESIDENT
23. US CITIZENSHIP

4.2 CONFIRMED ABUSE TYPE (*TYPE_CFM1 –8*), UNCONFIRMED ABUSE TYPE (*TYPE_UNCFM1 –8*)

1. EMOTIONAL ABUSE
2. EXPLOITATION
3. MEDICAL NEGLECT
4. MENTAL HEALTH NEGLECT
5. PHYSICAL ABUSE
6. PHYSICAL NEGLECT
7. SUICIDAL THREAT
8. SEXUAL ABUSE

4.3 SUMMARY INDICATOR OF CONFIRMED ABUSE TYPE (*IND_CFM1-11*), SUMMARY INDICATOR OF UNCONFIRMED ABUSE TYPE (*IND_UNCFM1-11*)

1. EMOTIONAL ABUSE
2. EXPLOITATION
3. MEDICAL NEGLECT (by caregiver)
4. MENTAL HEALTH NEGLECT (by caregiver)
5. PHYSICAL ABUSE
6. PHYSICAL NEGLECT (by caregiver)
7. SUICIDAL THREAT
8. SEXUAL ABUSE
9. MEDICAL NEGLECT (by self)

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10. MENTAL HEALTH NEGLECT (by self)
11. PHYSICAL NEGLECT (by self)

4.4 CARE VARIABLES (CARE1-57)

See variable list in attached CARE document (link).

4.5 COMMUNITY LEVEL VARIABLES (TCOMM1-44, ZCOMM1-44)

Variables with name starting with "t" are geocoded for U.S. census tract; variables with name starting with "z" are for zip.

1. Total population
2. Total male population
3. Total female population
4. Percent 60 years and older
5. Percent 60 years and older (male)
6. Percent 60 years and older (female)
7. Percent 65 years and older
8. Percent 65 years and older (male)
9. Percent 65 years and older (female)
10. Percent 75 years and older
11. Percent 75 years and older (male)
12. Percent 75 years and older (female)
13. Median age
14. Median age (male)
15. Median age (female)
16. Total Non-Hispanic White
17. Total Non-Hispanic Black
18. Total Non-Hispanic American Indian & Alaskan Native
19. Total Non-Hispanic Asian
20. Total Non-Hispanic Native Hawaiian & Other Pacific Islanders
21. Total Non-Hispanic Other Race
22. Total Non-Hispanic Multiple Races (2 or more)
23. Total Hispanic
24. Percent in poverty
25. Percent in poverty (65 years and older)
26. Households
27. Households receiving Food Stamps
28. Households receiving Social Security
29. Households receiving Supplemental Security Income

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30. Total Foreign-born
31. Total Foreign-born / Naturalized Citizens
32. Total disabled
33. Total 65 and older
34. Total 65 and older with disability
35. Total 65 and older with hearing difficulties
36. Total 65 and older with vision difficulties
37. Total 65 and older with cognitive difficulties
38. Total 65 and older with ambulatory difficulties
39. Total 65 and older with self-care difficulties
40. Total 65 and older with independent living difficulties
41. Total unemployed (16 and over population)
42. Total population 25 years and older
43. Percent with high school degree or equivalent (25 years and older)
44. Percent with Bachelor's degree (25 years and older)

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Quick Reference Guide

FYI Last updated September 29, 2008

Client Assessment & Risk Evaluation (CARE) Rating Examples

This quick reference guide is designed to assist you in making informed decisions when documenting your assessment of risk to an **APS** client. The following scores are used to rate the level of assessed risk to the client for each Factor: **No Problem**, **Managed Risk, Problem**, and **Severe Problem**. You can select **NA** (Not Applicable) when an item is clearly irrelevant to the client's situation or **UTD** (Unable to Determine) when evidence pertaining to an item is unavailable.

More Information

Click on a hyperlink in this menu to view information on the selected Domain, Factor, or Item number:

Living Conditions

Availability of Shelter
01 02

Grounds/Structure of Home
03 04 05

Hazards
06 07 08
09 10

Sanitation of Home
11 12 13
14 15 16

Necessary Resources
17 18 19

Financial Status

Income/Benefits
20 21

Financial Management
22 23 24
25

Physical/Medical Status

Physical Condition/Disability
26 27 28
29 30

Illness/Medication
31 32 33

Mental Status

Cognitive/Mental Status and Functioning
34 35 36
37 38 39
40 41 42
43

Problem Solving
44

Social Interaction/Support

Isolation/Connectedness
45 46 47
48 49

Relationship with Others
50 51

Response to Care, Abuse
52 53

Household Characteristics
54 55 56
57

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Living Conditions

Availability of Shelter

01. Availability of a home

- No Problem—Habitable shelter available.
- Managed Risk—(Do not use)
- Problem—Temporary shelter available.
- Severe Problem—Homeless with no access to shelter, or living in vehicle.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

02. Foreclosure, eviction, condemnation

- No Problem—No notice received.
- Managed Risk—(Do not use)
- Problem—Notice received, but foreclosure, eviction, or condemnation not imminent.
- Severe Problem—Notice received and foreclosure, eviction, or condemnation is imminent.
- NA —Homeless.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

Grounds/Structure of Home

03. Conditions attract, harbor pests

- No Problem—Grounds contain no stagnant water, high weeds or grass, abandoned furniture, non-working appliances, discarded tires, etc.
- Managed Risk—(Do not use)
- Problem—Potential attraction or harborage of disease-carrying pests on grounds, but no infestation.
- Severe Problem—Observable conditions such as stagnant water, high weeds or grass, abandoned furniture, non-working appliances, discarded tires, etc., that are attracting mosquitoes or vermin such as rodents.
- NA —Homeless.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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04. Water, sewage

- No Problem—Adequate drinking/washing water and sewage disposal.
- Managed Risk—(Do not use)
- Problem—Malfunctioning plumbing or unreliable availability of drinking/washing water or sewage disposal.
- Severe Problem—Lack of access to drinking/ washing water, or no effective sewage disposal.
- NA —Homeless.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

05. Structural soundness of home

- No Problem—Structure adequate and sound.
- Managed Risk—Structure needs some improvements or repairs but poses no safety hazard.
- Problem—Structure needs some improvements or repairs but poses no immediate safety hazard.
- Severe Problem—Home is unsound. Major structural problems. Poses immediate safety hazard.

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- NA —Homeless.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

Hazards

06. Fire hazards

- No Problem—No fire hazards, and client has accessible escape route.
- Managed Risk—(Do not use)
- Problem—Presence of fire hazards (e.g., frayed wiring and electrical cords, overloaded outlets, extension cords under rugs, flammable debris or objects close to heat sources, flammable materials improperly stored, poorly placed heaters, client smoking in bed). Client has accessible escape route.
- Severe Problem—Presence of fire hazards (e.g., frayed wiring and electrical cords, overloaded outlets, extension cords under rugs, flammable debris or objects close to heat sources, flammable materials improperly stored, poorly placed heaters, client smoking in bed). Client does not have accessible escape route.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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07. Safety Hazards

- No Problem—No safety hazards present (such as weapons or broken glass).
- Managed Risk—(Do not use)
- Problem—Safety hazards present with low potential for harm to client or others. (For example, weapons are present but are properly secured.)
- Severe Problem—Safety hazards present with high potential for harm to client or others. (For example, weapons are present but are not properly secured.)
- NA—(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

08. Drugs

- No Problem—No illegal drugs or drug paraphernalia present (observed or reported).
- Managed Risk—(Do not use)
- Problem—No illegal drugs present, but drug paraphernalia (e.g., bongs, roach clips, crack pipes) present.
- Severe Problem—Presence of illegal drugs or hazardous drug paraphernalia (e.g., needles, burners) presenting an imminent danger to the client, or evidence of drug distribution.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

09. Animals

- No Problem—No animals present, or presence does not impair use of the home or prevent self-care.
- Managed Risk—(Do not use)
- Problem—Presence, condition or behavior of animals is threatening to impair use of the home or threatening to prevent self-care.
- Severe Problem—Presence, condition or behavior of animals impairs use of the home or prevents self-care.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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10. Risk of falling

- No Problem—No apparent conditions likely to cause client to trip or fall.
- Managed Risk—(Do not use)
- Problem— Conditions exist that may cause a fall, such as debris or protrusions in walkways, slippery or uneven floors; and, client has difficulty with ambulation.
- Severe Problem—Conditions exist that present imminent risk of falling, client is frail and has history of falling; fall may result in serious injury to client.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

Sanitation of the Home

11. Odors

- No Problem—No or minimal odors.
- Managed Risk—(Do not use)
- Problem —Mild odor indicating inadequate sanitation.
- Severe Problem —Strong odors indicating sewage, natural gas or decaying organic matter.
- NA —Homeless.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

12. Garbage

- No Problem—Appropriate management of household garbage.
- Managed Risk—(Do not use)
- Problem—Some garbage or conditions indicating inadequate sanitation.
- Severe Problem—Large quantities of garbage or organic waste accumulation creating a sanitation hazard.
- NA —Homeless.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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13. Pest, rodent infestation

- No Problem—No evidence of pest/rodent infestation.
- Managed Risk—(Do not use)
- Problem—Some evidence of pest/rodents indicating mild infestation; potential sanitation hazard.
- Severe Problem—Visible pest/rodent infestation creating a sanitation hazard.
- NA —Homeless.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

14. Clutter

- No Problem—No or minimal clutter.
- Managed Risk—(Do not use)
- Problem—Accumulating clutter that may impair use of the home or may prevent self-care; impairs mobility.
- Severe Problem—Substantial clutter that seriously impairs use of the home or prevents self-care; impairs mobility.
- NA —Homeless.

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- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

15. Food storage

- No Problem—Proper storage of food.
- Managed Risk—(Do not use)
- Problem—Evidence of inadequate food storage (e.g., decaying food stored in refrigerator).
- Severe Problem—Exposed, decaying food that creates a health risk (e.g., rodents, food poisoning).
- NA —Client food supply is on a day to day basis; client has no spare food to store.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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16. Kitchen, bathroom

- No Problem—Adequate cleanliness in kitchen and bathroom.
- Managed Risk—(Do not use)
- Problem—(Do not use.)
- Severe Problem—Lack of cleanliness that is unsanitary or presents health hazard in either kitchen or bathroom.
- NA —Homeless.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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Necessary Resources

17. Utilities

- No Problem—Operational utilities (e.g., electricity, water, gas, heat/air conditioning, telephone), and temperature and ventilation are appropriate to climate and client's health.
- Managed Risk—Some utilities not operable, but do not present a risk to the client's health, safety, or well-being.
- Problem—Utilities not operable and presents a risk to the client's health, safety, or well-being.
- Severe Problem—Disconnection imminent or utilities not operable and client has severe medical condition(s) requiring utilities.
- NA —Homeless.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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18. Transportation

- No Problem—Access to affordable and reliable method of transportation to make necessary trips to purchase food or to obtain medical care and other necessities.
- Managed Risk—(Do not use)
- Problem—Method of transportation unreliable or too expensive to use consistently, or otherwise unacceptable to client.
- Severe Problem—No access to routine transportation to access food, medical care, or other necessities.
- NA —Food, medical care, and other necessities reliably delivered to client (no need for routine transportation).
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

19. Food

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- No Problem—Adequate supply of food appropriate for the client's diet with ability to replenish.
- Managed Risk—(Do not use)
- Problem—Inadequate supply of food or food supply is inappropriate for the client's diet.
- Severe Problem—No food is available, and client has no way to obtain food.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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Financial Status

Income/Benefits

20. Income, expenses

- No Problem—Monthly income is adequate to meet all expenses.
- Managed Risk—(Do not use)
- Problem—Occasional or temporary difficulty meeting some expenses OR monthly income is erratic.
- Severe Problem—Expenses for basic necessities routinely exceed income. Client is unable to afford all necessities.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

21. Benefits, resources

- No Problem—Client is enrolled in and is receiving all benefits available.
- Managed Risk—(Do not use)
- Problem—Client is not enrolled in all benefits available.
- Severe Problem—Client is not enrolled in any benefits available, is refusing needed benefits, or is at risk of losing current benefits.
- NA —Client does not need benefits.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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Financial Management

22. Client's management of own finances

- No Problem—Able to manage finances.
- Managed Risk—(Do not use)
- Problem—Manages money fairly well with occasional errors or needs help occasionally.
- Severe Problem—Financial mismanagement results in serious financial problems (e.g., excessive gambling, overspending) and deprivation of basic needs.
- NA —Someone else is managing client's money.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

23. Caregiver's management of client's finances

- No Problem—Caregiver is able to manage client's finances.
- Managed Risk—(Do not use)
- Problem—Caregiver's financial management is adequate with minor problems.

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- Severe Problem—Caregiver's financial management results in significant financial problems for the client.
- NA —Client is managing own money.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

24. Use of client's income, assets by others

- No Problem—No use of client's income/assets by others, or there is reasonable, approved use.
- Managed Risk—(Do not use)
- Problem—Others are dependent on client's income/assets with client's consent. The burden on client is moderate.
- Severe Problem—Others are making use of client's income/assets without informed consent or beyond the client's means. Or there is conflict within family regarding client's financial competence.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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25. Unusual financial activity

- No Problem—There is no unusual financial activity.
- Managed Risk—(Do not use)
- Problem—(Do not use)
- Severe Problem—There is unusual financial activity that warrants additional investigation (e.g., clear evidence of fraud, unusual transactions such as unusual credit card activity, unexpected name changes on accounts, or missing assets); client's assets are being rapidly depleted, resulting in imminent impoverishment or deprivation of basic needs.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

Physical/Medical Status

Physical Condition/Disability

26. Apparent injuries

- No Problem—No apparent injuries or only very minor injuries.
- Managed Risk—Injuries on extremities (e.g., skin tears, burns, or minor bruises) that caused minimal pain and resulted in no or minimal impairment of activities; and client received appropriate treatment.
- Problem—Injuries on extremities (e.g., skin tears, burns, or minor bruises) that caused minimal pain and resulted in no or minimal impairment of activities; and client has not received appropriate treatment.
- Severe Problem—Injuries indicative of physical abuse (e.g., bruises in the shape of objects, bilateral bruising suggestive of restraints, multiple injuries in different stages of healing, broken bones, wounds, burns), black eye, o signs of facial injury. Signs of infection. Needs medical intervention.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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27. Skin condition

- No Problem—Skin is intact with no observable rash, skin problems, pressure sores, or bruises.
- Managed Risk—Has skin conditions such as a rash, ringworm, scabies, skin tears, burns, minor bruises, small cuts, pressure sores and sunburn; and client received appropriate treatment.

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- Problem—Has skin conditions such as a rash, ringworm, scabies, skin tears, burns, minor bruises, small cuts, pressure sores and sunburn; and client has not received appropriate treatment.
- Severe Problem—Bruising that covers large area (over 3 inches); wounds with signs of infection (e.g., malodorous pus, redness); wounds filled with insects; gaping wounds; blistered skin from burns.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

28. Nourishment, hydration

- No Problem—Adequate muscle mass and skin fat on upper arms, face, buttocks. Moist mouth, normal perspiration.
- Managed Risk—(Do not use)
- Problem—Adequate muscle mass but little skin fat. Underweight or thin.
- Severe Problem—Small muscle mass. Flat or concave abdomen. No obvious skin fat, very thin, weak. Sunken eyes, dry mouth and tongue, absence of normal perspiration, tenting of skin.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

29. Grooming, hygiene, cleanliness

- No Problem—Appearance and body odor appropriate to setting.
- Managed Risk—(Do not use)
- Problem—Less attention to personal grooming and attire than average person without obvious explanation such as recent intense activity. Minimally soiled.
- Severe Problem—Disheveled. Unkempt. Filthy clothing. Has an unpleasant odor such as urine. Attire entirely inappropriate to the climate. Matted hair.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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30. Activities of daily living (ADLs)

- No Problem—Bathes, dresses, grooms, eats, uses the toilet, and ambulates all without assistance.
- Managed Risk—Problems with one or more ADLs; however, client has adequate assistance.
- Problem—Problems with one or more ADLs that interfere moderately with independent living (for example, needs help with buttons or opening jars; needs help getting in bathtub, but can bathe self) and client does not have adequate assistance.
- Severe Problem—Problems with one or more ADLs that interfere severely with independent living (for example, client is unable to dress self, to prepare meals, or to bathe self) and client does not have adequate assistance.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

Illness/Medication

31. Health

- No Problem—Has no health problems that require treatment.
- Managed Risk—Has health problems that are being adequately treated and client is able to access and manage treatment independently.
- Problem—Has health problems that are untreated but they are not immediately life threatening. For example,

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client has dental disease, vision or hearing disorders, or arthritis.

- Severe Problem—Has health problems that are untreated and they are potentially immediately life threatening without treatment.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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32. Self-administration of medication

- No Problem—Client knows medications, their schedules, and takes them reliably.
- Managed Risk—Client cannot manage medications but has adequate services in place (e.g., computerized medication dispenser, in-home services, etc.)
- Problem—Client cannot manage medications and does not have services in place. Occasionally may take wrong doses or miss doses of medications.
- Severe Problem—Frequently misses some doses or takes wrong doses of medications, or client is taking a large number of medications prescribed by different doctors with little or no medication management.
- NA —Does not have medications that require self-administration.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

33. Medical supplies, medications

- No Problem—Has sufficient supplies and medications on hand to cover the duration of the condition or to last until the next doctor/clinic visit.
- Managed Risk—(Do not use)
- Problem—Some supplies and medications are not on hand.
- Severe Problem—Out of supplies or medications vital to client's health or has some, but insufficient refills until nex doctor/clinic visit or has no scheduled doctor/clinic visit.
- NA —Does not need medical supplies or medications.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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Mental Status

Cognitive/Mental Status and Functioning

34. Orientation

- No Problem—Client can accurately tell date, time, location, and event.
- Managed Risk—Client cannot accurately tell date, time, location, or event but has adequate services in place to maintain client's health, safety, and well-being.
- Problem—Client cannot accurately tell date, time, location, or event and does not have adequate services in place to maintain client's health, safety, and well-being.
- Severe Problem—Client is totally disoriented; cannot name any orientation factors and/or has tendency to wander and does not have adequate services in place to maintain client's health, safety, and well-being.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

35. Thought processes

- No Problem —No noticeable paranoia, suspiciousness or delusional content. Able to answer questions clearly anc

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coherently without prompts.

- Managed Risk—Has noticeable paranoia, suspiciousness or delusional content. Is not able to answer questions clearly and coherently without prompts. Has adequate services in place to maintain client's health, safety, and well-being.
- Problem—Able to answer questions only with help or prompting. May have some delusions or hallucinations but does not act on them and does not have adequate services in place to maintain client's health, safety, and well-being.
- Severe Problem—Needs help to answer questions and doesn't receive it or answers independently but with significant paranoia, delusions, or grandiosity and does not have adequate services in place to maintain client's health, safety, and well-being.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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36. Recall of recent events

- No Problem—Can recall recent events, or can report at least one recent newsworthy story.
- Managed Risk—Cannot recall recent events, or cannot report at least one recent newsworthy story but has adequate services in place to maintain client's health, safety, and well-being.
- Problem—Has difficulty recalling recent events (e.g., breakfast or the reason for APS worker's visit after being told what worker is there for), or the most recent newsworthy story that can be recalled is a couple of years old and does not have adequate services in place to maintain client's health, safety, and well-being.
- Severe Problem—Cannot recall recent events, cannot report a newsworthy story, reports a story that is decades old, or makes up a false story and does not have adequate services in place to maintain client's health, safety, and well-being.
- NA—(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

37. Affect, mood

- No Problem—Client's mood appears appropriate to current circumstances. No unprovoked angry outbursts, laughter, or tearfulness.
- Managed Risk—Client's mood appears inappropriate to current circumstances. May exhibit some angry outbursts, laughter, or tearfulness, but has adequate services in place to maintain client's health, safety, and well-being.
- Problem—Unprovoked emotional outbursts that are not directed toward anyone. Some unexplained laughter or tearfulness and does not have adequate services in place to maintain client's health, safety, and well-being.
- Severe Problem—Unprovoked emotional outbursts that are directed at specific individuals or groups. Withdrawn, refuses to talk to others, and does not have adequate services in place to maintain client's health, safety, and well-being.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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38. Thoughts of suicide, homicide, self-injury

- No Problem—Client does not express thoughts of suicide, homicide, or self-injury.
- Managed Risk—(Do not use)
- Problem— Client or informants report that the client has verbalized feelings of depression and thoughts of suicide, self-injury or homicide. There is no expressed plan for suicide/homicide.
- Severe Problem—Client or informants report that the client has verbalized both thoughts of and a feasible plan to carry out suicide or homicide. May show evidence of self-injury or attempted self-injury or deliberate injury to

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others. Expresses no remorse or concern for self or others. Weapons readily available or are sought.
- NA—(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

39. Threatening behavior

- No Problem—Client is not a threat to self or others (housemates, neighbors, visitors).
- Managed Risk—(Do not use)
- Problem—Some evidence of threat to others but unable to verify, or client makes but does not carry out threats.
- Severe Problem—Client presents a safety risk to others (e.g., threatens physical harm to others or drives but is unable to do so safely).
- NA—(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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40. Bizarre behavior

- No Problem—No evidence of bizarre behavior.
- Managed Risk—Exhibits behaviors that seem bizarre but has adequate services in place to maintain client's health, safety, and well-being.
- Problem— Exhibits behaviors that seem bizarre (e.g., rocking, picking at clothes), but are neither verbally nor physically aggressive/violent and does not have adequate services in place to maintain client's health, safety, and well-being.
- Severe Problem—Exhibits behaviors that seem bizarre (e.g., cannot sit still, moves constantly, repetitive action to complete task), is either verbally or physically aggressive/violent and does not have adequate services in place to maintain client's health, safety, and well-being.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

41. Alcohol, substance abuse by client

- No Problem—No evidence of abuse of alcohol or substances by client (e.g., illicit or prescription drugs).
- Managed Risk—(Do not use)
- Problem—Evidence of occasional abuse of alcohol or substances by client (e.g., illicit or prescription drugs).
- Severe Problem—Evidence of active or chronic abuse of alcohol or substances by client (e.g., illicit or prescription drugs). For example, client has slurred speech, a staggering gait, or bloodshot eyes, or has fresh needle track marks or other clear evidence of recent drug use.
- NA—(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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42. Mental illness, dementia

- No Problem—Has no diagnosis of mental illness or dementia.
- Managed Risk—Has diagnosis of mental illness or dementia and has adequate services in place to maintain client's health, safety, and well-being.
- Problem—(Do not use)
- Severe Problem—Has diagnosis of mental illness or dementia and does not have adequate services in place to maintain client's health, safety, and well-being.

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- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

43. Mental retardation

- No Problem—Has no diagnosis of mental retardation.
- Managed Risk—Has diagnosis of mental retardation and has adequate services in place to maintain client's health, safety, and well-being.
- Problem— Has diagnosis of mild or moderate mental retardation and does not have adequate services in place to maintain client's health, safety, and well-being.
- Severe Problem—Has diagnosis of severe or profound mental retardation and does not have adequate services in place to maintain client's health, safety, and well-being.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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Problems Solving

44. Understanding problems

- No Problem—Able to understand, identify and solve current life problems.
- Managed Risk—Unable to understand, identify, and solve current life problems and has adequate services in place to maintain client's health, safety, and well-being.
- Problem—Understands that there are problems, but cannot articulate scope, extent, or severity; or cannot identify or implement solutions and has no adequate services in place to maintain client's health, safety, and well-being.
- Severe Problem—Does not understand or denies current life problems and has no adequate services in place to maintain client's health, safety, and well-being.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

Social Interaction/Support

Isolation/Connectedness

45. Involvement with family, community

- No Problem—Social contacts are varied and frequent.
- Managed Risk—(Do not use)
- Problem— Client sees people with some regularity, but the contacts are either infrequent or limited mainly to people inside the home.
- Severe Problem—Client has little or no contact with others.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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46. Feelings of loneliness, isolation

- No Problem—Client expresses no feelings of loneliness or isolation.
- Managed Risk—(Do not use)
- Problem—Client gives passing, mild expression to feelings of loneliness or isolation.
- Severe Problem—Client gives frequent, strong expression to feelings of loneliness or isolation.

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- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

47. Community resources

- No Problem—Client or caregiver knows about and is willing to use appropriate community resources.
- Managed Risk—Client or caregiver knows appropriate community resources and chooses not to use them, but has adequate resources to ensure client's health, safety, and well-being.
- Problem—Client or caregiver knows about some appropriate community resources but not others, or has some reluctance to use them.
- Severe Problem—Client or caregiver either has no knowledge of appropriate community resources, or cannot be persuaded to use them.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

48. Access to emergency help

- No Problem—Client or caregiver knows how to get help in an emergency. Is willing to do it and has the physical and mental ability to do it. Has the means to do it. Help is close by.
- Managed Risk—(Do not use)
- Problem—Client's or caregiver's abilities, means of communication, or the proximity of help could slow down asking for or receiving help in an emergency.
- Severe Problem—Client's or caregiver's abilities, means of communication, or willingness to call may prevent asking for or receiving help in an emergency.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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49. Autonomy

- No Problem—Client has freedom of movement, and there is no undue influence, enforced isolation, or unreasonable confinement.
- Managed Risk—(Do not use)
- Problem—Someone is inappropriately attempting to restrict the client's freedom of movement or trying to control his/her behavior, but client is able to maintain autonomy.
- Severe Problem—Someone is inappropriately attempting to restrict the client's freedom of movement or trying to control his/her behavior, and client is unable to maintain autonomy. Impact is severe.
- NA —(Do not use)
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

Relationship with Others

50. Ongoing relationships

- No Problem—Client has congenial relationships with others in the home and/or those with whom s/he is in frequent contact. Conflict is minimal.
- Managed Risk—(Do not use)
- Problem—Client has occasional or mild conflict with others in the home and/or those with whom s/he is in frequent contact.
- Severe Problem—Client has frequent, severe conflict with others in the home and/or those with whom s/he is in frequent contact, or self-isolates.

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- NA —There are no others in the home or those with whom s/he is in frequent contact.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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51. Effects of others' actions

- No Problem—Client suffers no ill effects from the actions or inaction of others in the home and/or those with whom s/he is in frequent contact.
- Managed Risk—(Do not use)
- Problem—Client is mildly or occasionally bothered or inconvenienced by the actions or inaction of others in the home and/or those with whom s/he is in frequent contact.
- Severe Problem—Client suffers anguish, significant deprivation, or physical harm (e.g., violence, sexual abuse) from the actions or inaction of others in the home and/or those with whom s/he is in frequent contact.
- NA —There are no others in the home or those with whom s/he is in frequent contact.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

Response to Care, Abuse

52. Responsiveness to care

- No Problem—Client welcomes needed care OR client mildly or occasionally resists or complains about needed care or care provider.
- Managed Risk—(Do not use)
- Problem—Client frequently or strongly resists or complains about needed care or care provider.
- Severe Problem—Client consistently resists or refuses essential care. Agencies refuse to send care provider to client's home because of client's behavior.
- NA —Client needs no care.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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53. Response to abuse, neglect by others, exploitation

- No Problem—Client has quickly reported and shown unwillingness to tolerate previous validated instances of a/n/e.
- Managed Risk—(Do not use)
- Problem—Client has delayed reporting or minimized previous validated instances of a/n/e.
- Severe Problem—Client did not report previous validated instances of a/n/e or denied that they happened.
- NA —No previous validated cases of client a/n/e.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

Household Characteristics

54. Alcohol, drug abuse by others

- No Problem—No evidence of alcohol or substance abuse by paid caregiver or by family or others who live with or care for the client (e.g., illicit or prescription drugs).
- Managed Risk—(Do not use)
- Problem—Evidence of occasional alcohol or substance abuse by caregiver (e.g., illicit or prescription drugs).
- Severe Problem—Evidence of active or chronic abuse of alcohol or substances by caregiver or by family or others who live with or care for the client (e.g., illicit or prescription drugs). For example, has slurred speech, a staggering

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gait, or bloodshot eyes, or has fresh needle track marks or other clear evidence of recent drug use.
- NA —There is no paid caregiver or family or others who live with or care for the client.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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55. Caregiver stress, burnout

- No Problem—No evidence of stress or burnout in family or others who live with or care for the client (e.g., has social support; other obligations such as marital, parental, or work do not compete with client care).
- Managed Risk—Some evidence of stress or burnout in family or others who live with or care for the client, but adequate services are in place to maintain client's health, safety, and well-being and caregiver's stress and burnout.
- Problem—Some evidence of stress or burnout in family or others who live with or care for the client (e.g., has some physical, financial or psychological strain but has some social support; other obligations such as marital, parental, or work sometimes compete with client care).
- Severe Problem—Clear evidence of stress or burnout in family or others who live with or care for the client (e.g., has physical, financial or psychological strain as well as marital, parental or work obligations that compete with client care; is easily frustrated, irritated, or angered by client; potential depression or has exaggerated emotional outbursts; caregiver has no social support).
- NA —There are no family or others who live with or care for the client.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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56. Ability, knowledge, willingness to care for client

- No Problem—All caregivers are able to care for client, are knowledgeable about client's condition, and are willing to care for client.
- Managed Risk—(Do not use)
- Problem—At least one caregiver has limited or declining ability, knowledge, or willingness to care for client.
- Severe Problem—At least one caregiver is not able to care for client, does not know how to care for client, or not willing to care for client.
- NA —There are no caregivers.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

57. History of violence, criminal conviction

- No Problem—Family or others who live with or care for the client do not have a history of violence and do not have felony criminal convictions.
- Managed Risk—(Do not use)
- Problem—Family or others who live with or care for the client have displayed minor acts of aggression toward client or have threatened client on rare occasions. No substantive incidents have occurred, and there is no apparent current threat to client. Do not have history or conviction of crimes against persons or financial crimes.
- Severe Problem—Family or others who live with or care for the client have history of violence; or of psychologically, verbally, or physically abusing client; or have history or conviction of crimes against persons or financial crimes.
- NA —There are no family or others who live with or care for the client.
- UTD—Use when, despite your best investigative efforts, you are unable to gather sufficient information to determine whether a Problem exists.

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