Allegheny County Department of Human Services and the Centre for Social Data Analytics (CSDA) at Auckland University of Technology (AUT) thanks Eticas for their review of the homeless predictive risk model developed for Allegheny County, known as the Allegheny Housing Assessment (AHA). DHS generally agrees with Eticas' analysis and offers the following response to Eticas' findings. The following outlines DHS's response to Eticas' analysis, as well as details how DHS has incorporated these findings into the tool's design and implementation.

FINDING 1: OVERALL ACCURACY OF THE MODEL

Eticas found the predictive model to be accurate, as using off-the-shelf tools with some parameter tuning did not yield a better model. Eticas did not identify any improvements to be made to the model. Eticas did note that the 0–17 age group is heavily underrepresented in the training data used to build the model. As a result, it was Eticas' opinion that the combined risk score or other metrics should not be computed for this group, as the accuracy of the model for that group cannot be properly evaluated. Eticas recommended that this group be handled separately by a business rule, and not by the model.

DHS Response: DHS notes that only two unaccompanied children (aged 0–17) were part of the research data set used to build and train the model, which included 5,550 client records. Unaccompanied children who experience homelessness in Allegheny County are served by the county's child welfare system rather than its homeless system. For this reason, unaccompanied children under age 18 will not enter the homeless system and the AHA tool will not be used with this population.

FINDING 2: ALGORITHMIC DISCRIMINATION

In its analysis, Eticas evaluated the model to determine if the algorithm and the risk score it produced introduced a large disadvantage for potentially already disadvantaged groups. Eticas did not find that the model introduced any such disadvantage or discrimination for such groups and recommended the following for each group:

a) **Disability:** Eticas observed that people with disabilities are positively discriminated by the algorithm and does not flag this as a reason for concern.

b) **Gender:** Eticas observed that there were no major disadvantages provided based on gender but did observe a slight false negative rate which could provide a disadvantage for women. Eticas recommended that future assessments of the model should verify if women are more likely to be under-protected than men. Eticas recommended that DHS closely monitor the performance of the model with respect to scoring for men and women.

c) **Age:** Eticas observed that there were no disadvantages provided between age groups that were not explainable by the inherent differences between those groups.

d) **Race:** Eticas observed that there were no large disadvantages between race groups that were not explainable by the inherent differences between those groups, or by the fact that the race group labeled "other" is smaller than the other groups and thus statistics on it may exhibit more variability.

e) **Veteran status:** Eticas observed some inconsistencies with false negative rates in which veterans are more under-protected for households without children (singles) and less under-protected in households with children (families). Eticas recommended that DHS implement business rules specific to this group.

f) **Property-based discrimination:** Eticas found no correlational evidence of socioeconomic discrimination in the model through proxies such as race. Eticas recommends that given the sensitivity of the system, DHS should monitor this variable in the future by using direct information about income or employment.

DHS Response

DHS responds to each recommendation as follows:

a) **Disability:** DHS is comfortable with the possible 'overprotection' of people with a disability given it favors this most vulnerable group. Further, having a disabling condition is required to establish chronic homelessness per HUD's chronic homelessness definition. DHS has implemented business rules to ensure that in situations where people received the same predictive risk score, those that are chronically homeless (and therefore have a disability) will receive higher priority. The chronically homeless are a priority population for DHS and the homeless system in Allegheny County.

b) **Gender:** DHS acknowledges that any gender disparity is of concern, even the slight under-protection of women identified by Eticas' analysis. Additional analysis performed by the research team that developed the model indicates that once the business rules that DHS has developed for the tool's implementation are applied, the slight disadvantage that remains is primarily for single females. Following implementation, the research team (AUT) will closely monitor false negative and false positive rates overall and by gender and will report regularly on this to DHS so that unwarranted disparities by gender can be quickly identified and addressed.

c) **Age:** DHS welcomes the finding that there are no notable disparities in model performance across different age groups.

d) **Race:** DHS welcomes the finding that there are no notable disparities in ALPHA performance across different age groups.

e) **Veteran status:** DHS is pleased that discrepancies for veterans were low but intends to closely monitor the performance of the model for single veterans as there is a potential disadvantage for that group. Conversely, the false negative rate for veterans within families shows that this group is overprotected, which is favorable given the priority status given to this group through DHS's business rules. Veterans remain a priority group in that they are eligible for housing units dedicated specifically to veterans. They can also receive referrals to housing units available to non-veterans, and veteran status is a tiebreaker favoring the veteran when two people have the same risk score. DHS and AUT will closely monitor how the tool impacts this population.

f) **Property-based discrimination:** DHS is pleased that Eticas found no evidence of socioeconomic discrimination and will closely monitor the performance of the model across income and employment indicators to detect and respond to any emerging disparities.

FINDING 3: FUTURE RE-MODELING

Due to the potential change in composition of the homeless population, Eticas recommended that DHS conduct re-modeling at least once a year with new data, maintaining some consistency with the methodologies used before, but also introducing new methodological elements if they are found to produce good results. Eticas recommended running an analysis of algorithmic fairness over different groups and combinations of groups, understanding that small differences are inevitable, but looking for large differences that can be addressed by business rules on top of the main model. Additionally, Eticas recommended documenting carefully the training dataset and the modeling process through model cards, and making this documentation public, allowing researchers access to microdata that allows them, with appropriate data sharing agreements in place, to examine the models closely.

DHS Response

DHS responds to each recommendation as follows:

a) **Re-modeling:** DHS acknowledges that regular model rebuilds are part of any quality predictive risk modeling implementation and DHS is committed to ensuring this happens with its homeless predictive risk model. This is particularly true at the time of the model's implementation in August 2020, with the COVID-19 pandemic expected to continue to have an impact on all aspects of Allegheny County's systems and the clients utilizing these services. Rebuilding the model will help to ensure that it continues to reflect the local reality of homeless services in Allegheny County, including drivers of homelessness and the potentially changing composition of the homeless population. Rebuilds also provide a valuable opportunity for the research team to rectify problems identified during normal quality assurance and monitoring activities, like unwarranted variations in the treatment of different protected groups. DHS has asked (AUT) researchers to rebuild the AHA tool after one year using updated data, and to advise DHS on any methodological changes that could improve the performance of the tool. After the AHA tool has been implemented, the methodology for testing of a rebuild will need to take into account the non-experimental nature of the data sets. DHS will ask the research team to be vigilant about this.

b) **Fairness Analysis:** DHS and AUT will conduct regular quality assurance monitoring of the implemented tool. This monitoring is designed to detect unwarranted variations in the treatment of protected groups. DHS and AUT will review this data at least monthly and problems identified by this monitoring will be rectified via immediate tool fixes and/or amended business rules, as warranted. Non-urgent or minor changes will be addressed via annual rebuilds of the AHA tool.

c) **Microdata Access:** DHS expects to release an RFP for a process and impact evaluation of the AHA tool in 2021. As part of the impact evaluation, DHS will release microdata to the selected evaluator. Further, DHS has been and continues to be open to sharing appropriately de-identified data sets with external parties for research purposes.

FINDING 4: EXPLAINABILITY

Eticas recommended that DHS establish a clear communication strategy with stakeholders about the AHA tool, its development, implementation and impact. Eticas recommended that this information be made available to clients in a friendly and accessible manner, taking into account the clients' vulnerable condition.

DHS Response

DHS strongly agrees with Eticas' recommendation that DHS follows a clear communication strategy with stakeholders before, during and after implementation of the AHA tool. During the development of AHA, DHS continuously engaged with multiple stakeholder groups, including:

1. Clients experiencing homelessness

2. Local service provider agency direct line staff, supervisors, and leadership

3. DHS senior leadership, including director and deputy directors

4. Allegheny County Homeless Advisory Board (HAB) membership, i.e., the Continuum of Care board of directors, executive committee, and membership responsible for planning and policy oversight of the CoC

5. National homeless experts and researchers from across the country

6. Local funding agencies and foundations

7. U.S. Department of Housing and Urban Development (HUD) representatives

DHS also has established an online tool, called AccessMyInfo, that clients can use to access their demographic and service utilization information.

DHS has published multiple reports about the AHA tool that are publicly available, including:

1. [Frequently Asked Questions about the AHA tool](#)

2. [Report on Client Focus Groups](#)

3. [Methodology report about the technical implementation and model development](#)

DHS is committed to continued engagement with clients; homeless services providers; and local and national leaders in homeless research, practice and governance following the implementation of the AHA tool. DHS will also work to ensure that information about the AHA tool is available to people experiencing homelessness in a form that is accessible and easy to understand.

FINDING 5: DESIRABILITY

To improve acceptance of the tool by workers and clients, Eticas recommended that DHS consider conducting formal training for frontline workers who will use the AHA tool. Further, Eticas recommended that DHS collect data on worker and client satisfaction with the tool.

DHS Response

DHS strongly agrees with Eticas' recommendations for formal training with frontline workers, and DHS has completed this training prior to the implementation of the tool. DHS has provided multiple trainings for all frontline workers involved in the homeless coordinated entry system. Trainings have covered an overview of how the AHA tool was developed, the analytic approach of predictive risk modeling, and how the client assessment process works within the coordinated entry data system. DHS has also provided training to homeless service provider staff on these topics and will provide future trainings as needed.

DHS also strongly agrees with Eticas' recommendation that DHS collect data on worker and client satisfaction with the AHA tool. DHS has a working group for the AHA tool that has met biweekly during the development of the tool, including staff from DHS's homeless coordinated entry program. This group will continue to meet regularly to discuss AHA's implementation and monitor the tool's performance and impact. Additionally, DHS intends to release an RFP for a process evaluation in 2021. This evaluation will involve significant data collection on staff and client satisfaction with the tool.

As already mentioned, DHS conducted focus group sessions with people experiencing homelessness during the development of the AHA tool. A report on these sessions can be found here. DHS intends to continue to engage clients following the implementation of AHA to learn about their experiences and to receive feedback on the AHA tool and other aspects of the homeless service system.