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About Predict Align Prevent

Why was Predict Align Prevent founded?

Half of the children who die from child abuse and neglect are not in "the system." These children, usually age 0-3 years, live unobserved by the people most likely to notice they are in trouble and help them. They look for help and comfort from the people who harm them, and can do nothing to protect themselves.

This is also true for the children who survive abuse and neglect. For them, the stress and uncertainty of their existence fundamentally changes the way their bodies and minds develop, adaptations that help them to survive. But, survival often comes at the cost of lifelong physical, mental, social, and economic health problems that perpetuate their suffering for many years after the abuse and neglect is over.

As a society, we don't yet know how to prevent the heartbreaking experiences of the little children who are killed or seriously injured. We also don't know what it takes to change the life trajectory of the children who survive, to give them the best possible chance of living a healthy, prosperous, and connected life.

These are the problems Predict Align Prevent was founded to solve.

What are our qualifications?

Predict Align Prevent (PAP) is a Texas-based 501(c)(3) nonprofit organization dedicated to the prevention of child abuse and neglect.

Dyann Daley, M.D., Founder and CEO of Predict Align Prevent, bridges the medical and spatial epidemiological aspects of PAP's work. Dr. Daley has been a practicing pediatric anesthesiologist for 13 years. Currently, she is an Associate Professor of Pediatric Anesthesiology with the University of Arkansas Medical School and Arkansas Children's Research Institute, with clinical responsibilities at Arkansas Children's Hospital. Previously, she was the founder and executive director of The Center for Prevention of Child Maltreatment, led by Cook Children's Healthcare System, in Fort Worth, Texas.

Predict Align Prevent partners with Urban Spatial Analytics, and founder Ken Steif, PhD, to offer geospatial machine learning workflow development, analytics, and consulting. Dr. Steif is the Director of the Master of Urban Spatial Analytics program at the University of Pennsylvania.

The original code base and custom routines developed through PAP's partnership with Urban Spatial are written in the open-source programming language R and made freely available. Our data and methodological standards are fully transparent, and seek to answer the question "where will child maltreatment occur in the future?" This commitment to open science allows us to work directly with child welfare department data scientists and/or university researchers who have the prerequisite skill set to implement our geospatial machine learning workflow internally, promoting sustainability.

Predict Align Prevent is working closely with Casey Family Programs on expansion of this work across the United States.

Who is Predict Align Prevent working with?

Virginia Department of Social Services, Arkansas Division of Children and Family Services, Washington Department of Children Youth and Families, New Jersey Department of Children and Families, Oregon Department of Human Services and Oregon Health Authority, New Hampshire Department of Health and Human Services, Washington DC Child and Family Service Agency, Missouri Department of Social Services, and Prevent Child Abuse North Dakota.

What is an effective primary prevention bundle (that stops child maltreatment before it occurs)?

In medicine, a prevention “bundle” is the combination of effective guidelines and practices that reliably prevents an unwanted outcome, such as a hospital-acquired infection.

PAP is seeking the combination of effective guidelines and practices that reliably prevent child abuse and neglect. Geospatial risk modeling tells us where child abuse and neglect are likely to happen and also what is contributing to the risk, laying the foundation for strategic planning for prevention.

For example, if, in the 10% of a city’s area where 70% of child abuse and neglect will occur, variations of family violence are the most predictive risk factors, will prevention of violence also prevent child abuse and neglect? What if reduction of teen pregnancy and increase child care options are added? What if the utilization of substance abuse treatment centers is improved, or there is increased availability of crisis housing, or abandoned buildings that attract crime are replaced with community-friendly spaces? Some combination will result in effective prevention of child abuse and neglect in the highest risk places. This combination is the “bundle” we seek.

By working in many different cities and states, each with their own unique synergy of prevention resources, we should find effective solutions more quickly.

Once a reliable prevention bundle is found, we will work with governments and communities to spread the practices far and wide to make an impact to end suffering and improve outcomes for vulnerable children across the nation.

Predict Phase

What is geospatial risk mapping?

Our environment influences our behavior in predictable ways. In a library, you’ll find people reading. In a club, you’ll find people dancing. If you wanted to find people playing basketball, where would you look? A good place to start would be a basketball court near a high school during after-school hours on a day with nice weather.

Defining the characteristics of an environment that supports a behavior, like playing basketball, can help you predict where you’ll find people exhibiting that behavior in the future.

Geospatial risk modeling is a kind of statistical analysis that processes information about places to find meaningful relationships between certain behaviors and the environment surrounding the behaviors. These relationships are easy to understand when you see them on a map.

What are the characteristics of places where children experience abuse and neglect? This is the question we answer with geospatial risk modeling.

Risk factors for child abuse and neglect are well known, including substance abuse, mental health issues, domestic violence, community violence, low education, social isolation, family disorganization, parenting stress, young children, children with special needs, concentrated neighborhood disadvantage, and parental history of child abuse and neglect. Some of these risk factors, such as domestic violence, can be analyzed as points on a map.

When we take the locations of known child abuse and neglect and look at the relationship to the locations of known risk factors, we begin to discover the characteristics of places that support the behaviors of child abuse and neglect.

What we've found so far is that in small areas, about the size of two football fields, where there is a lot of domestic violence, community violence, and teenage runaways, we also find all types of child abuse and neglect. In just 10% of a city's area, about 70% of child abuse and neglect will occur. In that 10% we also find most of the child deaths caused by abuse and neglect, and removals of children into foster care.

How is this different from other kinds of predictive analytics? Well, it is very hard, if not impossible, to predict how a specific person will behave in the future, which is the goal of person-based predictive analytics. Sometimes, parents with all of the risk factors do NOT abuse or neglect their children. Using our place-based strategy, we can't say who will be the perpetrator or victim will be, only where abuse and neglect are likely to occur.

It is in these places where protective and prevention resources will do the most good for vulnerable children.

What is the difference between location-based and person-based predictive analytics?

Predict Align Prevent's methodology does not use a person-based approach to predictive analytics. Our place-based approach reduces the risk of citizen privacy concerns.

The only HIPAA-protected data required for geospatial risk modeling is the location where a child maltreatment event occurred. No additional personal identifiers are required or requested.

Our predictive variables are fully transparent, and geospatial machine learning routines and code are open source, which addresses concerns about bias which may be present in proprietary, non-transparent algorithms.

Our clients are primarily child welfare agencies because they are the "owners" of child maltreatment data and, in collaboration with health and human services administrations, in the best position to conduct geospatial risk predictions. As such, they are also in the best position to sustain the practice.

Is geospatial risk mapping the same as hotspots?

Traditional cartographic 'hot spots' are spatial point densities. These density 'predictions' are just a function of nearby point events. The geospatial risk prediction approach predicts by weighting exposure to risk factors that the literature suggests are associated with maltreatment. One major benefit of the risk prediction approach is that unlike density hotspots, it is able to identify at risk areas despite the fact that no actual maltreatment has occurred.

We already know where these problems happen. What does the PAP program provide that we don't already know?

Maltreatment is a relatively rare event. The geospatial risk prediction approach reveals at a very high resolution, where maltreatment risk is prevalent despite the relative infrequency of occurrence.

Explain causation vs. correlation in regards to your work?

In traditional econometrics, a host of phenomena including multicollinearity, can bias our understanding of whether x causes y . This is less of an issue in machine learning, where the goal is to create a model that is accurate (meaning low relative average error) and generalizable (meaning that errors are comparable across policy relevant groups, like rich and poor neighborhoods). Put another way, econometrics is focused on external validity while machine learners work to ensure that predictions will lead to more effective resource allocation relative to the current decision-making process.

How do you address bias related to poverty or race?

Machine learning models trained on data generated from human biases will also exhibit bias. This does not mean these models are not useful. Instead, the analyst must 1) develop metrics that identify any underlying bias, 2) contextualize risk predictions with other useful metrics, and 3) most importantly, consider any underlying bias when using the predictions to allocate a limited resource.

Align Phase

What is community alignment and how is it beneficial?

The Adverse Childhood Experiences (ACEs) study, and decades of supportive research demonstrates that children who survive early-childhood abuse, neglect, and chronic adversity often suffer a lifetime of physical, mental, educational, and social health problems. Long-term outcomes include shorter life expectancy, chronic disease and disability, obesity, smoking, alcohol and drug abuse, risk of intimate partner and sexual violence,

depression and anxiety, suicidality, sexually transmitted infections, unintended and/or teenage pregnancies, low birth weight and fetal death, psychological disorders, risk of aggressive and/or criminal behavior, low educational attainment, unemployment, and poverty. Many of these outcomes are risk factors for child maltreatment and for multigenerational perpetuation of exposure to adverse childhood experiences.

From geospatial risk mapping, we know that many of these outcomes co-occur in areas where the risk for child abuse and neglect is high. All of the coalitions, departments, initiatives, and other efforts to prevent these problems are working with the same people in the same places, and they are all working on a shoestring budget. What if prevention efforts were combined to address the common risk factors across problems? The effect of prevention would be multiplied at a reduced cost, and with less administrative burden for the affected populations.

This is the goal of alignment.

Prevent Phase

What is the Prevent phase of your program's continuous improvement loop?

A continuous quality improvement cycle begins by identifying problems, monitoring solutions and studying the effectiveness and efficiency of initiatives.

This information allows stakeholders to make ongoing improvements to optimize for quality, the experiences of the people served, and cost-effectiveness.

We implement a continuous quality improvement cycle for the purpose of identifying effective solutions for child maltreatment prevention that are reliable at scale across jurisdictions.

Ethics

In 2019, Tim Dare of the University of Auckland, New Zealand, wrote an independent ethical analysis of the Predict Align Prevent program. How do the benefits of geospatial risk mapping and related community alignment outweigh the risks?

In his independent ethical analysis, Professor Tim Dare of the University of Auckland, NZ, concluded, *"I am satisfied that the PAP program has the potential to deliver genuine benefits while avoiding some of the familiar risks of alternative approaches to targeting child protection services.*

While I identify a number of grounds for ethical concern, I am satisfied that, on balance, the benefits of the PAP program would outweigh the risks it poses. It is my view that implementation of the Predict-Align-Prevent Program can be justified from an ethical perspective."

Benefits

1. Protected, personal information about individuals is not required because predictions are about places, not people.

- *"PAP differs from many social policy uses of predictive analytics in that it is place- rather than individual- or family-based."*
- *"The overall focus of the program does not require the use of what is in some jurisdictions called 'personal information'."*
- *"If an implementation decision consists, for instance, in increasing the concentration of protective factors in areas identified as high-risk, there may be no need to explicitly engage with or know the identity of at-risk individuals or families."*
- *"If there is a correlation between factors such as the concentration and proximity of risk and protective factors and the risk of maltreatment, then one might alter maltreatment risk by decreasing factors shown to be correlated with risk and increasing factors shown to be protective in an area. Doing so would not require access to information about individuals or families who might benefit from those changes."*

2. The ethics of predictive analytics in social policy depend on how the information is used. PAP includes implementation components in the Align and Prevent phases.

- *"Whether the use of predictive analytics in social policy contexts is ethical always depends to a significant degree upon implementation decisions. Decisions about how predictions are used in engagement with individuals, families, or communities will typically determine whether the use of predictive analytics as part of a policy process is ethical or not. To its credit, PAP includes commitment to significant implementation components: The Align and Prevent phases are implementation phases."*

3. PAP's Program is unusually, "strikingly and admirably transparent."

- *"For the most part, the model is strikingly and admirably transparent. It is proposed to develop a comprehensive open source framework for developing child maltreatment predictive models and to document a strategic planning process for converting maltreatment risk predictions into actionable intelligence that stakeholders will be able to use to allocate limited child welfare resources. The program documentation contains information on variables and methods. The program aims to be unusually transparent to child protection professionals and modelers."*

In the same report, ethical considerations associated with the PAP program were identified. Where relevant, PAP's response to the ethical consideration is noted below:

Ethical consideration: *"PAP should be aware of threats to the integrity of the data upon which the initial maps rely and have an account of steps which have been and will be taken to ensure that their influence is avoided or mitigated."*

Ethical consideration: *"It is important that PAP consider the possibility that the increased allocation of child protection resources to high risk areas could lead to increased surveillance and reports in those areas, threatening the integrity of data which might be relied on in future modeling."*

PAP response: Child protection resources are typically made available to specific individuals after suspicion of maltreatment is reported to a child welfare agency. The aim of PAP is to help communities use data to align protective and prevention resources for vulnerable populations *before* there is a suspicion of maltreatment.

Ethical consideration: *"It is important that PAP consider the possibility that the increased allocation of child protection resources to high risk areas could lead to increased surveillance in those areas."*

Ethical consideration: *"For the moment, I suggest that PAP monitor implementation decisions made during the Align and Prevent phases, and appreciate their potential ethical implications."*

PAP response: Any implementation action that results in increasing ACEs for children in high risk locations would be counterproductive to prevention. For example, if a response to crime attracting locations resulted in increased arrests for non-violent crimes, the imprisonment of caregivers would constitute at least one new ACE for the children of that caregiver. Prevention options should be thoughtfully selected to avoid increasing ACEs for a community.

Ethical consideration: *"It is important that the process does include significant barriers to the recovery of address level data, and that there is a process for managing any privacy breaches which do occur. It seems important that PAP have a process for making such re-identification difficult, and for managing any privacy breaches which do occur."*

PAP response: The locations of known child maltreatment events are used to create predictive models by data scientists in HIPAA secure environments. The resulting risk maps do not show locations of child maltreatment, only locations of risk which are based on publicly available crime and infrastructure data.

Sometimes, location data is visualized to demonstrate accuracy, or the co-occurrence of problems in the places where child maltreatment risk is high. In these cases, the scale is large enough to avoid re-identification, and points are "jittered" to avoid re-identification.

Ethical consideration: *"To the extent that the areas which are identified as high-risk at the Predict phase of PAP are subject to existing stereotypes and prejudice, the program has a responsibility to guard against stigmatization at the outset, and to identify ongoing mitigation for any stigmatization burdens the program does create or reinforce. Stigmatization depends upon the communication of stigmatizing messages. Consequently, one way to guard against stigmatization is to control access to stigmatizing or stigma-reinforcing information."*

PAP response: Existing stereotypes and prejudices are contributory to risk factors for child maltreatment, and acknowledging and defining that truth can help communities address racial and economic disparities.

Ethical consideration: *"The PAP program should consider whether and to what extent the program might lead families to move beyond the reach of services and how to minimize that danger."*

Frequently Asked Questions

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Ethical consideration: *"PAP should consider carrying out a population analysis of areas identified as high risk to determine whether particular groups are disproportionately represented in those areas. This will help obtain some sense of the risk that the program will discriminate indirectly against those groups."*

PAP response: Machine learning models trained on data generated from human biases will also exhibit bias. This does not mean these models are not useful. Instead, the analyst must 1) develop metrics that identify any underlying bias, 2) contextualize risk predictions with other useful metrics, and 3) most importantly, consider any underlying bias when using the predictions to allocate a limited resource. These steps are incorporated into the PAP workflow and are detailed in the accompanying technical report.

Ethical consideration: *"The PAP program should explore ways to increase transparency about the PAP program at least in those communities in which it is used."*

PAP response: The data that drives the PAP program originates from and belongs to communities. We believe it is of critical importance to share the results of analysis directly with the affected communities because community-based prevention solutions are more likely to be successful.

Ethical consideration: *"Any services or protective programmes offered under the Align or Prevent phases of the program which do engage with individuals (e.g., which go beyond changes to the concentration of risk and protective factors in an area) may generate their own consent requirements."*

PAP response: Consent for services for individuals, if offered, would be obtained by community-based service providers.