Improving Processes & Practices in Child Welfare:

Is Cognitive Computing Part of the Solution?

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Introduction

The federal Commission to Eliminate Child Abuse and Neglect Fatalities recently published a major report on the state of the child welfare field, titled "Within Our Reach – A National Strategy to Eliminate Child Abuse and Neglect Fatalities."[1] The Commission's chair opened the report by stating: "If we as a nation do nothing different to prevent child abuse and neglect fatalities, somewhere between 1,500 and 3,000 U.S. children will die from maltreatment in 2016, 2017, and beyond. I know this because these numbers have remained constant for many years." Another troublesome finding of the two-year study was that "although... we know a lot about what puts children at risk, there are relatively few promising or evidence-based solutions." The 12 commissioners,

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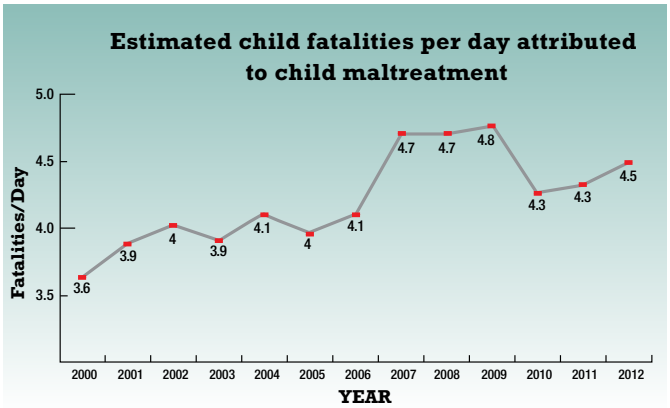
who included numerous recommendations in their report, unanimously agreed on the need for more and better research to identify and deploy evidence-based solutions.

Eliminating child fatalities attributable to abuse or other maltreatment is arguably the most important goal of our nation's child welfare system, so the Commission's roadmap ought to become an integral part of future planning by practitioners and policymakers alike. Within the context of this white paper, prepared by Stewards of Change Institute, however, it is also necessary to point out that a majority of activities in the field focus on concerns other than safety relating to the critical importance of permanency and well-being. Against this backdrop, we believe the Commission's findings and recommendations are even more important and revealing. That's because, even though the report focused sharply on child fatalities, many if not most of its insights readily apply to the rest of the work being done in the field as well.

Paraphrasing the first paragraph above, although we know a lot about providing counseling, addressing crises, providing services and the like, "there are relatively few promising or evidence-based solutions." Furthermore, the conclusions of "Within Our Reach" converge with our primary observations and recommendations. These include the Commission's core emphasis on the need for better, shared, real-time data and research to improve decision-making and its calls for "multidisciplinary support for families" and "collaboration and coordination of more of the organizations that already interact" with them. And finally to this proposition: "Strong leaders at every level are needed to work across systems and forge a path to a new child welfare system."



Note: National data is likely to underestimate the number of children who died from maltreatment

Cognitive computing provides a unique and powerful set of tools that could be used to address many of the Commission's recommendations relating to child fatalities – as well as the wider spectrum of issues currently faced by our country's child welfare system. Below, we describe what this emerging technology is and how it could be valuable to the field.

Our principal intent is to generate greater awareness about cognitive computing, so that child welfare officials can make better-informed decisions as they consider upgrading, modernizing or replacing their current information technology systems. A major factor influencing these decisions is the likely authorization of the new Comprehensive Child Welfare Information System (CCWIS) regulations, proposed by the federal Bureau for Children and Families. These new regulations respond to a long and persistent call for greater flexibility, bi-directional

information-sharing, and more evidence-based decision-making. This white paper also aims to achieve one more objective: to serve as a call to action, because many of the needs in the field are immediate and extensive, and it appears that one potentially game-changing means for addressing them is now available. Possible next steps include pilot projects utilizing cognitive tools; instigating research to determine best practices; and creating scalable models in collaboration with universities and philanthropies. Additional suggestions, in more detail, are listed in the Recommendations section of this paper on page 21.

Background

For over a decade, the Stewards of Change has convened and collaborated with government, industry, academia and nonprofit leaders to drive progress in policy, practice and structures across the intersecting domains of health, human services, juvenile justice, public health and education, among others. The Stewards' research, consultation and advocacy work have focused primarily on advancing information-sharing, interoperability and person/family-centric care, with the bottom-line objective of improving the lives of children and families, while strengthening the communities and systems on which they depend. From its inception, one of the Stewards' priorities has been to help child welfare systems at all levels better-serve their stakeholders through utilization of the most current approaches and technologies.

Cognitive computing is one of the most promising of new technologies because it can address a primary impediment to child welfare professionals: the inability to gather, analyze and utilize the most-useful information with which to do their work, and using that information to coordinate an increasingly complex network of care to promote greater organizational efficiency by providers and better outcomes for clients. Cognitive computing holds the promise of significantly mitigating that impediment, and perhaps even overcoming it.

This white paper, underwritten by IBM, examines how this technology could impact the child welfare field in particular and social programs in general. In the next section, it provides a brief overview of the field, followed by an explanation of cognitive computing, and then a hypothetical case-study scenario to illustrate how child welfare personnel and their clients might experience an environment reshaped by cognitive tools. Subsequently, the paper describes the application of cognitive computing to a variety of problems and unmet needs hampering the child welfare system and for which current tools and technologies are inadequate. We then consider the larger health and social services environment in which child welfare organizations operate, and the potential opportunity to apply cognitive computing to provide assistance and support for evidence-based decision-making. Finally, the paper provides a short roadmap for moving forward, key findings, recommendations and conclusions.

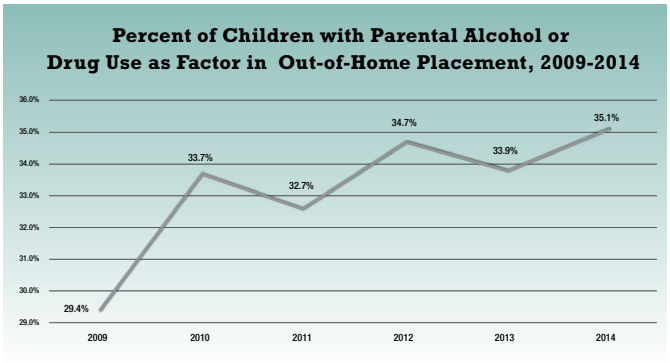
Research for this paper included a broad literature review, roundtable meetings in three cities around the U.S. with more than 50 child welfare leaders, and additional input from more than a dozen child welfare and technology professionals. While it is not definitive or conclusive, it offers an overview of critical issues and suggests a path for making substantive progress toward the goals that health, human services and child welfare professionals have long been working to achieve.

Key Issues in Child Welfare

After declining nationally by more than 20 percent between Fiscal Years 2005 and 2012, to a low of 397,000, the number of children in out-of-home (foster) care rose sharply in the latest two years for which records are available[1a], to a high of 415,000 in FY 2014. Furthermore, the 14,000-child surge from 2013 to 2014 was the largest annual increase in over a decade. The biggest segment of growth, 6,400 in the latest statistics, was of girls and boys aged 0-3 who entered the child welfare system. Additional figures from the Department of Health and Human Services were also disheartening: The number of adoptions from foster care in 2014, at 50,608, was the lowest in a decade, with a drop of about 1,500 from the

previous year; and the nearly 108,000 children with adoption plans or whose parents' parental rights had been terminated was the highest number since 2010.

While there is no conclusive research on why these trends are occurring, most experts and children's advocates agree that a substantial factor is the opioid/

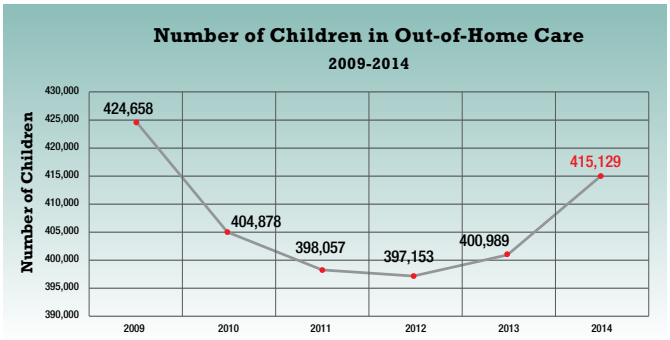


heroin epidemic sweeping much of our country. Prenatal exposure to drugs and/or alcohol affects over 500,000 babies per year, with potentially serious implications for health and wellness (special needs, disabilities, etc.) and an escalating number of them are winding up in the child welfare system. Furthermore, child welfare agencies in many states report that the opioid crisis is stretching their limited funding, personnel and other resources in additional ways, as it causes a wide variety of serious stresses on families. The Child Welfare League of America reports[2] that this mounting challenge to agencies is occurring even as federal financial support is being cut, for instance to programs with funding sources such as Title IV-B Child Welfare Services, Title IV-B Promoting Safe and Stable Families, the Child Abuse Prevention and Treatment Act and the Social Services Block Grant.

These issues – that is, constrained budgets and the opioid crisis – are only two among the many significant day-to-day and strategic challenges faced by child welfare officials and workers in executing their mandate. What follows, as context for this white paper, is a brief look at some of these issues, followed by a glimpse of how cognitive computing might be used to make progress on some of them.

More children are being removed from their homes because of reported abuse or neglect. The consequences of the statistics cited at the start of this section are far-reaching, ranging from requiring additional training for workers to deal with the opioid epidemic, to increased worker caseloads and an escalating need for more foster parents to care for the rising number of children. Moreover, there is growing recognition in the field that every time a child is moved from home to home, the impact is traumatic, so better tools are needed to minimize the number and duration of placements by better recruiting and training of kinship/foster families, as well as by improving the placement of individual children with specific families who can best meet their needs. Child welfare professionals also recognize that they need better methods to help them identify risks and provide protections in order to decrease the possibilities of harm to children, four to eight of whom die from abuse or neglect every day at the hands of parents or caretakers as documented in the "Within Our Reach" commission report.

New Child Welfare Information System (CCWIS) regulations. These proposed regulations from the Administration for Children and Families of HHS encourage child welfare systems to access and



share data bi-directionally and in real time with other systems and agencies. This initiative represents a new approach and a different set of requirements for sharing and using information for decision-making purposes. The CCWIS guidance is one of many examples of federal promotion of greater information-sharing and cross-silo cooperation; these efforts, not coincidentally, come at a time when child welfare

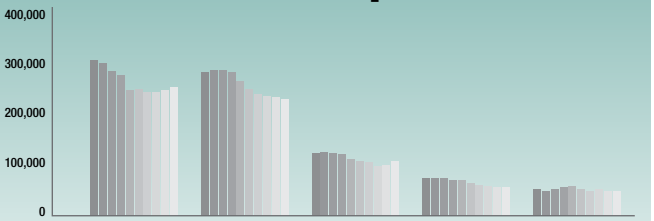
agencies themselves are increasingly embracing – at least in principle, and increasingly in practice – the value of case-management coordination among the multiple health and human services systems that typically serve the same client.

Improving training, retention and effectiveness. Even the most successful child welfare leaders report that attracting and sustaining a competent, dedicated and vibrant workforce – one that combines energetic newer employees with senior, experienced ones – is becoming more difficult as a result of growing caseloads, outdated tools and processes, lack of

availability and optimal use of technology, declining attraction and benefits of working in government, and a lack of engaging, ongoing education to remain current on best practices. At the same time, child welfare systems throughout the county are expending billions of dollars on services without comprehensive measures of how effective they are, even as demand is growing from policymakers and supervisors for better measurement and accountability. Both of these pressures on the workforce require enhanced tools to accomplish an array of tasks, from determining how to better train and retain personnel, to improving decisions about the allocation of services for particular populations, to assessing the impact of those services.

Disproportionate representation of children of color. African American and Latino families are more likely than white families under similar circumstances to be reported for child abuse or neglect, as well as to have their children removed. This is the case even though studies have documented[3] that "there are no differences in the incidence of child abuse and neglect according to racial group." The bottom line is that these children and youth make up more than 55 percent of the foster care population, though they constitute just one-third of all children in our country. Children of color also tend to remain in care for longer

Trends in Foster Care and Adoption: FY 2005-FY 2014



	Entered	Exited	Waitng for Adoption	Parental Rigts Terminated	Adopted
2005	307,000	286,000	131,000	78,600	51,600
2006	305,000	295,000	135,000	79,900	50,700
2007	293,000	295,000	134,000	82,000	52,700
2008	280,000	289,000	126,000	79,400	53,300
2009	255,000	278,000	114,000	71,400	57,200
2010	256,000	258,000	109,000	65,700	53,500
2011	252,000	248,000	107,000	62,900	50,900
2012	252,000	241,000	102,000	59,100	52,000
2013	255,000	240,000	104,000	59,700	50,800
2014	265,000	238,000	108,000	60,900	50,600

(Based on data submitted by States as of July 9, 2015)
Source: AFCARS data, U.S. Children's Bureau, Administration for Children, Youth and Families

periods and, while they are in the system, they receive fewer caseworker contacts, written case plans, and developmental/ psychological assessments than do their white counterparts.[4] This "disproportionality," as it has been labeled in the field, is believed to be abetted by higher poverty rates among the families of children of color. Better information, training and tools clearly could help to address these issues, as well as to figure out how to tackle the broader systemic problems involved.

Policymakers and practitioners at all levels are in ongoing dialogue about how to address these and other challenges – and some are devising potentially effective solutions that should be tested

and implemented. Few, however, have yet to include cognitive computing on their list of options. Here, we present some of the ways this emerging technology might be useful, in particular through its ability to read, understand and analyze much more information, of far greater variety, than the workers or supervisors have previously been able to access. By doing so, they could be better-enabled to make decisions about issues such as:

- The effectiveness of specific services for families and children, with detailed guidance on how to maintain children safely and permanently at home.
- The necessity to act immediately and/or in a particular manner to respond to intake calls regarding suspected child abuse or neglect.
- Whether children are at a higher risk of death or serious injury due to future abuse and/or neglect.
- Which family might be the best placement (ex., kin or not), if that becomes necessary, in order to minimize traumatic multiple moves within the foster care system.
- The factors to include in deciding, and the prospects for successfully returning the child safely to his/her home.
- The most potentially successful placement for a particular child, for instance, adoption or permanent guardianship.

The Potential of Cognitive Computing

The field of child welfare in the U.S., according to professionals and researchers, has made demonstrable progress over the last several decades in implementing evidence-informed policies and practices; increasing adoption and other permanency rates; and, most importantly, improving the safety and well-being of children and youth in government care. That is the good news. Notwithstanding the ongoing efforts of state and federal officials, however, the unfortunate reality is that not a week goes by without a story in the media about social workers who cannot keep up with their burgeoning caseloads; about foster families who are struggling to receive appropriate services to meet their children's special needs; and, most disconcertingly, about children in the system who have continued to be abused, neglected or, infrequently but too regularly, have died despite warning signs all around, but no ability to connect the data residing in different systems. There is clearly room for technology that can improve our results.

Cognitive computing. . . represents a powerful, paradigm-changing tool that child welfare leaders also could incorporate to more-efficiently and cost-effectively address some of the most persistent and vexing problems they currently face.

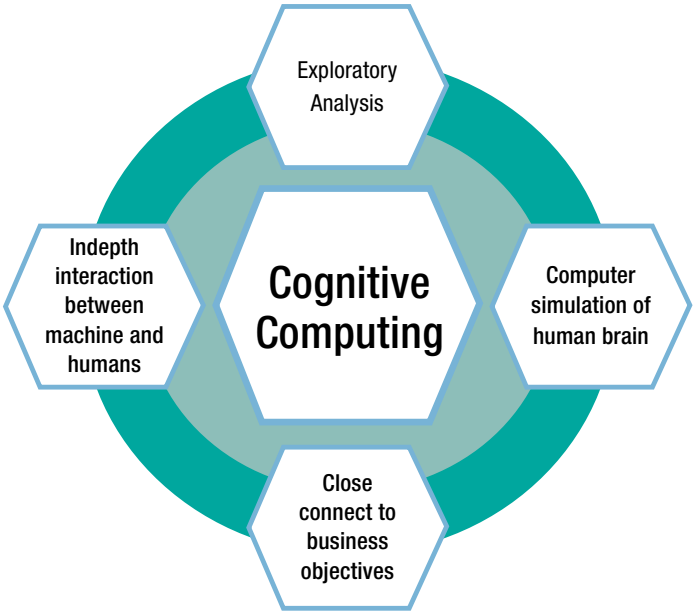
Its ability to mimic human behavior, knowledge and intellectual capabilities, and to utilize the vast amount of available processing and storage resources, would enable us to acquire knowledge and insights that could lead to significant, systemic improvements in child welfare policy, practice and outcomes – which ultimately could translate into increasing the quality of people's lives, as well as saving them[5].

Cognitive computing offers the capacity to perform tasks and use skills that until now have been considered to be uniquely human, such as the ability to understand written or spoken language, to recognize objects within images, to recognize and distinguish complex patterns in order to predict specific outcomes, and to learn and improve over time[6]. These specialized skills have been encapsulated and packaged for public use via standardized, easy-to-use "APIs" (application programming interfaces). In short, cognitive computing opens the door to a wealth of possibilities that were rarely considered an option before because the barriers to entry – a great deal of specialized knowledge, technology, time and money – were so high.

Perhaps the most significant aspect and contribution of cognitive computing is its radical departure from relying on traditional database tables that are loosely interconnected through very limited, well-defined, rigid definitions. It literally changes our entire view of the data and knowledge that are accessible to us,

making pattern-matching, predictive analytics, holistic 360° views, and intelligent searches much more accessible. Cognitive computing, for the first time, is providing a toolset that allows us to access information that was once considered to be unattainable, and to get it in a very pragmatic, friendly and familiar interface.

Stipulating that cognitive computing offers significant advantages, the question is how its capabilities could be utilized to drive improvements within child welfare.



Some of the functions that might be used include:

- Natural Language Processing – taking free-form text in either a structured or unstructured format, reducing it to its most basic meaning and making it "machine readable."
- Speech-to-Text and Text-to-Speech – recognizing and transcribing free-flowing speech, and vice versa.
- Speech Language Translation – converting speech from one language into another in real time[7]
- Visual Recognition – recognizing and identifying objects within photographs or images.
- Predictive Analytics – after "training" by ingesting historical data and a hypothetical scenario, predicting probable outcomes (sought by the user) and "ranking" them in order of likelihood of success.
- Machine learning – a type of artificial intelligence (AI) that provides computers with the ability to learn without being explicitly programmed. Machine learning focuses on the development of computer programs that can teach themselves to grow and change when exposed to new data.

For example, IBM's Watson[8], perhaps the most famous cognitive supercomputer, is trained by feeding it all kinds of text, images, videos and audio information – in a multitude of formats from virtually any type of source – which it then analyzes and incorporates into its representation model of the world, known as its knowledge base. After training is completed, Watson is ready to answer questions, return search results, present scored and ranked results, or execute any custom program that it is configured to run under specific circumstances. In the same way, child welfare workers could receive a series of ranked alternatives relating to what action they could consider taking relating to a particular question or client. Cognitive computing in general could provide workers with a comprehensive view of the most-salient existing knowledge and guidance, so that they can make the best-possible decisions with the most information available, in real time.

Cognitive computing has recently made substantial advances and is becoming increasingly commercialized, with worldwide, with meaningfully positive results, in sectors ranging from finance[9] to law [10, 11] to healthcare[12] to driverless vehicles[13, 14] to drug research[15], and to many other fields. The research conducted for this white paper leads us to believe that child welfare could benefit from incorporating this technology into its systems, processes and day-to-day operations because it would: provide access to the otherwise dormant knowledge trapped in legacy systems; provide new insights from enhanced modeling and analytics; and offer recommendations based on extensive data with which to make better decisions.

A Brief Case Study: A Day in the Future of One Social Worker

The following hypothetical case study is presented to illustrate how cognitive computing and associated technologies could be used by a worker during the course of a day. Note that some of the capabilities described have not yet been developed, but are within reach with sufficient investment and training.

Alissa, a new caseworker at the state child welfare agency, starts her workday by checking her smart phone at home. Her to-do list, created by her agency's cognitive computing-enabled case-management system, "looks" at her personal calendar and email, and the agency's system identifies several case alerts she needs to review and respond to. One of them requires a home visit with a client. The case involves a mother and two children whose situation was stabilized about nine months ago, after an abusive boyfriend went to jail for injuring the children and threatening the family's then-caseworker.

While Alissa is formulating her plans, the system analyzes a broad array of information about the family's members and their location, aggregated from multiple agencies with which they have interacted. Alissa knows she needs to address at least one aspect of the Safety Plan that had been formulated for the family, because the system had recognized that the former boyfriend – the one convicted for the incident described above – listed the mother's address as his residence on his recent release papers from jail. Alissa's case-management system suggests a security officer accompany her on the visit. She agrees, which automatically triggers a request to the local police station through a link with its dispatch system. The dispatcher schedules an officer to meet Alissa at the family's address, and she accepts that appointment on her schedule.

Alissa then calls her agency's automated training system and asks which modules would be the best fit given the circumstances of this particular case. The system suggests a few training modules, based on Alissa's previous preparation and background, as well as how the most-experienced and successful workers have dealt with case information similar/comparable to this particular family's situation. She selects and then takes the highest-ranked module, which is about follow-up investigative interviews for cases that have been closed for a period of time after being stabilized, with the children at home. She lists the case mentioned above as the reason for the training. The module incorporates the basic facts of this case into its scenario and records the results of Alissa's training.

The Cognitive Tools Available to (or Used by) Alissa

- Task Prioritization using her case records, communications, Geographic Information System and personal schedule, based on key data found in case records (such as when the family was last visited or when to return for a visit).
- Case Information Monitoring to highlight tasks needing high-priority attention, to suggest actions based on agency policies, and to identify key words and themes in case notes.
- Case and Personal Safety/Risk Calculations, based on available information or identifiable patterns from similar cases, with validation options.
- Skill-Development Curriculum and Guided Casework, including context-sensitive module suggestions for specific scenarios.
- Context-Aware Reminders and Policy Guidelines.
- Resource Search, with insights on service providers' population types, proximity to client, hours, etc.
- Voice-to-Text and Text-to-Voice interaction between people and systems.

Cognitive Computing in Use Today: Lessons from Healthcare

Insights into how cognitive computing might be used in child welfare can be drawn from its current applications in healthcare diagnosis and treatment by IBM's Watson Health[16] division. Watson[17] is the product name of IBM's cognitive computing system, the use of which is growing quickly in the realms of engineering, finance, healthcare, consumer goods, basic research[18] and other fields. We explored several Watson initiatives in healthcare to gain insights into how cognitive computing might be adapted to child welfare. Two of the efforts currently underway – relatively early in their implementation, but with enough progress to assess how and how well they are proceeding – are Watson's partnerships with the Cleveland Clinic[19] and the Memorial Sloan Kettering (MSK) clinic[12, 20].

Cognitive computing's first step toward mastering a domain is to learn its language and literature, so that it understands the words, concepts, research and texts that compose its cumulative knowledge. At Memorial Sloan Kettering, a team of physicians and researchers drew "from an impressive corpus of information, including MSK curated literature and rationales, as well as over 290 medical journals, over 200 textbooks, and 12 million pages of text," so that Watson could understand the field of medicine generally, and oncology in particular[21]. The literature covered the biology and DNA characteristics of cancer growth and reaction to treatments, as well as how those factors interact with the biology and DNA of various types of patients.

In addition, all of the case histories and experiences in MSK's medical records were fed into Watson, including both the structured data and the physicians' and nurses' notes, test results, treatments provided and patient outcomes. Watson's cognitive capabilities enabled it to understand the contents of the medical records, which it synthesized with the knowledge it had gained about oncology and medicine; together, they allowed Watson to create an internal model of how cancer functions from a biological standpoint, how it is most accurately diagnosed, and which treatments work best on specific cancer types with specific patient types.

In another project, IBM teamed up with the Cleveland Clinic on two projects: the Electronic Medical Record (EMR) Assistant and Watson Paths[19]. In the former, the Watson team worked with medical personnel to learn how they could best interact with the information in their EMR system so that they could be as efficient and effective as possible. In Watson Paths, they extended that effort to model how the most-experienced and most-effective personnel operated over time to interact with patients, enter and retrieve information from the EMR, choose diagnostic procedures, select treatments, and follow up with patients and others on the medical team. This model of how the most-experienced people functioned was then configured as an educational tool for medical students transitioning from academic to practical medical training stages in their programs.

Watson Oncology helps physicians by providing a list of available options at every step, and ranking them according to levels of confidence about their likely effectiveness. The physician and patient make all the decisions, but they do so with better information than was previously possible. The MSK and Cleveland Clinic projects demonstrate how cognitive computing is being deployed in ways that potentially could be replicated in child welfare. The system would learn the literature and language relating to the field; analyze case histories and outcome information; access information in key systems; and utilize it in the most-beneficial ways for interacting with users. Then it would create a model for training all staff to act more like the best and most-experienced practitioners. Medicine is well-informed by basic research in biology, diseases and treatments. In fact, one of the key deliverables of Watson Oncology is to be able to keep up with the ongoing torrent of relevant new studies. Over 13,000 papers are estimated to have been published worldwide on oncology alone last year, well beyond any practitioner's ability to keep up with the latest developments.

The MSK and Cleveland Clinic projects demonstrate how cognitive computing is being deployed in ways that potentially could be replicated in child welfare.

Watson Oncology is now being used by about 20 U.S. cancer treatment centers, as well as by a cancer

treatment organization with many locations in India, and its growth is accelerating globally[22]. The longer and wider its usage, the more information will be generated on how best to utilize it and, as a result, how best to keep improving the underlying model of care. The early use of IBM's Watson effort in this and related fields, such as life sciences research, was sufficiently successful that IBM created a separate division, IBM Watson Health, and a subgroup, Watson Oncology. Then they expanded the scope of Watson Health to include social programs such as child welfare, as well as economic support, employment support and care-management systems/products including its Cúram Solutions[23] for managing health and social programs. More recently, IBM invested billions of dollars to acquire health data-management companies[24] and other health-related[25] organizations to position itself for growth in the health and social services sectors, including child welfare. IBM evidently believes the benefits of cognitive computing to these fields will be significant, and perhaps even transformative.

The benefits Watson Oncology now provides to its users, from enhancing training to providing decision support, also could apply to child welfare. The path to achieving these benefits would be different, and perhaps more challenging, however, for a variety of reasons. For instance, child welfare operates in a complex environment due to the interplay of social, emotional, behavioral and clinical factors affecting each case, as well as the vagaries of individual judgment and lack of evidence for decision-making. In contrast, medicine has a more-extensive body of research and quantitative measures, and a workforce that is more experienced with technology. That said, there are sufficient parallels between the two fields, especially regarding case management, to assume that cognitive computing would be useful for addressing the equally complex, constantly evolving problems facing child welfare.

Applications of Cognitive Computing to Child Welfare

Given the progress that cognitive computing has enabled within oncology, and given that the healthcare field has complex case-management fundamentals comparable to those in child welfare, it seems fair to conclude that this promising technology could also have significant value for child welfare. Moreover, given that the new Comprehensive Child Welfare Information System (CWIS) regulations are being promulgated, the time would appear to be right for the field to assess whether cognitive computing could help to accomplish CCWIS' explicit objective: promoting more-effective, real-time sharing – and the effective use of that data by child welfare systems with other systems and agencies. On its face, it seems evident that cognitive computing could indeed help to achieve this goal.

That said, it is important to point out that cognitive tools cannot simply be transferred, but would have to be trained to meet the circumstances, systems and other elements of the child welfare field, in general, and of specific agencies or other users, in particular. Cognitive computing can understand content and meaning after being "trained" on the language and body of knowledge within a given field. Just as was the case with its introduction to medicine, law and finance, a team of child welfare experts would need to curate the training and testing process until it is reliable and consistent. Once the system has mastered the language and knowledge, analyzed very substantial amounts of case data and outcome indicators, and formed models of how the field works most effectively in a jurisdiction, they can be applied to support users and applications in that region.

Below we have identified some of the possible applications of cognitive computing for child welfare. Each one addresses a key challenge or deficiency within the current suite of tools and applications available within the field today. However, it is important to note that each application will have different requirements and require a different level of investment and testing to prove its efficacy. Lessons learned from other industries presumably will be instructive for gauging the level of effort and potential payback for each application. We have placed all the applications below into three groups, which are explained below: Document Summaries and Guidance; Aggregate Data and Case Management Assessments; and Research-Based Decision Support Tools.

Group 1: Document Summaries and Guidance

Existing text and documents such as policy manuals, court records, confidentiality rules, laws, training materials and others can be absorbed early in the development of a cognitive system, making their contents available to access. Once the system has received the data, analyzed it and configured it to answer inquiries in a desired format, staff can tap into needed information from virtually any device 24/7. We believe this application could be relatively quick to implement because it is not dependent on integration with case-management systems or significant modeling efforts. For example, a new worker could ask about an agency's requirements for conducting an initial investigation with a specific type of client, or what the guidelines are for interacting with a family facing particular difficulties.

One value of cognitive computing is that specific questions and answers do not need to be identified and prepared in advance, as with most Frequently Asked Questions (FAQs) today. Instead, the system can be trained to understand the knowledge derived from a diverse array of sources, and can then respond to questions in formats that are easily understandable and accessible. IBM's Watson was taught to master a huge range of information, for instance, that it used to win against the best players of all time on the television gameshow "Jeopardy." That victory depended on

When one Jeopardy clue was "Fluffy pie topping and long boring speech," Watson replied: "What is a meringue harangue?"

mastery of information in history, science, literature and many other realms, and required understanding of a quirky word format – i.e., answers had to be stated as questions. When one Jeopardy clue was "Fluffy pie topping and long boring speech," Watson replied: "What is a meringue harangue?"

Policy and Regulation Guidance

The range of guidelines, procedural manuals and regulations with which caseworkers need to comply is substantial. Cognitive computing tools could absorb all these reference documents and provide an easy means for asking questions about their contents. Doing that could be relatively simple, comparable to how questions can currently be asked about nearly anything to Siri on Apple phones or Google on Android phones. Services such as this could substantially extend the availability and impact of training investments.

Confidentiality and Privacy

As data is increasingly shared among agencies and other organizations, questions are increasingly raised about which confidentiality/privacy laws and policies apply in various situations. Documents explaining those laws and policies could be absorbed by a cognitive system, with the guidance of legal experts to help in the training, so that personnel at all levels could then ask questions about specific types of data and circumstances – and could receive recommendations about what data can or cannot be released to whom and when. The system could also provide guidance on whether specific proposed data-sharing arrangements are appropriate.

Group 2: Aggregate Data and Case Management Assessments

The examples listed above involve documents and information being consumed by a cognitive system and then being configured to address inquiries and

answer questions regarding their contents. Another level of adapting cognitive computing is to link it to the IT system already in use. In this way, the cognitive tools become aware of all information about agency cases and operations, as well as guiding documents such as policy manuals. The contents of an agency's current information system could be absorbed by a cognitive system, which could then be trained, for example, to search case notes for cases that are not complying with policies and procedures. Cognitive tools could also be configured to list the possible implications of a specific policy change for all of the cases in the database to which that change would apply. This capability could identify all the cases in which an investigation is overdue, or could review whether the case notes contain sufficient answers to key questions to meet Child and Family Service Review standards included in the agency's Performance Improvement Plan.

An additional benefit of cognitive computing could be its ability to automatically adjust its "understanding" of compliance, without reprogramming or delays, as new documents are entered or as policy guideline documents are changed. Furthermore, the system could generate reminders of pending deadlines, tasks that are overdue or steps not taken in sequence, etc. These could clearly help staff stay organized and within policy guidelines – including complying with the new CCWIS guidance – while also providing supervisors with an effective management tool. Another example: The results from analyses of the disposition of cases and casework in the context of agency guidelines could be delivered as reports or alerts to relevant personnel. Additional examples of how cognitive systems could be used after being linked to a case-management system are discussed below.

Information and Data Search

A number of tools are already being used to calculate a family's risk and safety profiles as part of the evaluation of the likelihood of suspected child abuse or neglect in that family. Workers often find it difficult to find the time to sufficiently research family case histories to provide complete, accurate input for the requisite questionnaires. The value of these risk-assessment tools can be greatly diminished, or biased, by inaccurate or incomplete information. A cognitive system could review all available records relating to a family and suggest what information needed to be examined by the caseworker in order to make an informed judgment, and could automatically update the risk and safety calculations whenever data changed.

The system could also prepare a summary of case data for particular purposes, such as a list of items that should be confirmed during a home visit. The list might include the number of children who should be accounted for within the household; evidence that other adults are living in the house when none are indicated; or active psychotropic medications that have been prescribed to children to verify their appropriate administration. Newly assigned case workers could query the system about potential re-abuse or safety indicators that are buried in the case notes but that could be easily overlooked due to limited review time. Cognitive computing could summarize key data from the entire record, keep it visible and make it readily accessible.

Data Sharing and Interpretation

Data-sharing among organizations serving the same clients is extremely important for a variety of reasons, ranging from having a comprehensive view of the people involved to rooting out fraud, waste or abuse. Data-sharing efforts have increased dramatically over the years, but much more progress is needed to effectively increase our actionable knowledge. Cognitive computing could not only enhance and accelerate data-sharing through new and less-disruptive means, but also could help translate the intent of the exchanged information. That is, information may be perceived as having a different importance, urgency or even meaning within the transmitting organization than in the receiving one.

Two quick examples follow from other realms to illustrate how the same information can be interpreted differently by various audiences, underscoring the value of "translating" meaning so it is broadly

understood (as cognitive computing can do). First, a specific number of absences or suspensions in one school system may be grounds for a student's expulsion, causing serious disruption in that family, but another school system may use that same number to trigger a social worker's visit to the student's home. Or police and prosecutors in one jurisdiction may be aggressive about pursuing some crimes, again risking large disruption for a family already under stress, while officials in a different area may view the same crime as a less-serious offense. Extrapolating to the field of child welfare, cognitive systems could help agencies better understand communications from other organizations, including by "translating" information from the format used by its source into one that's most-recognizable and useful for the agency.

Child and Family Services Reviews (CFSR) and Performance Improvement Plans (PIP)

CFSRs involve auditors reviewing not only the data in a case management system, but also deep reading of the worker's notes and other available documents relating to specific cases. The amount and level of information that auditors require is often challenging for staff to provide on an ongoing basis, both because of their heavy caseloads and because of the often-lengthy documents involved. There is concern, however, as expressed most recently in the Fatality Commission's report, referenced previously, that critical information may exist in case plans that, if identified, could prevent re-abuse or future fatalities.

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A cognitive system could assist the case review and CFSR process by reading all relevant information and alerting reviewers about the presence of known risk factors, missing data, dubious patterns, and other indicators that could require the attention of the organization's staff and supervisors. These reviews could be done proactively and regularly to identify potential problems or practice violations. Additionally, if/when Program Improvement Plans are established, the guidelines and approaches in them could be absorbed into the cognitive computing system for ongoing monitoring, reporting and/or compliance alerts.

Staff Training and Development

Just as cognitive computing tools are already starting to be utilized in healthcare training to help new medical workers develop the abilities for diagnosis and treatment possessed by the most experienced and expert staff (described in the Watson Oncology section above), the same could be applied to the child welfare field. Agencies could utilize them for training programs and models for new and less-experienced employees. This application likely would require substantial training of the cognitive system itself, and therefore could fall either into this group of applications or in the one if significant research were needed before it could be fully implemented.

Data Sharing Security Management

When linked to a live case-management system, cognitive tools could also help assess whether information requests from a bi-directional data exchange comply with regulations. For example, they might provide insights into the requestor, the proposed use of the data and/or whether it could be unintentionally exposed in its new location. Also, if the cognitive system was linked across many organizations that shared data, it could monitor exchanges to ensure that information remains protected in compliance with the regulations that govern its use. Finally, this advanced technology could provide "psychological insurance;" that is, helping the parties to data-sharing feel more confident about security and compliance.

Group 3: Research-Based Decision Support Tools

The groups of applications outlined above would require the cognitive computing tools to consume the literature relating to the field, link each system and then provide training to configure it for a particular use. Examples in both those groups demonstrate

ways in which cognitive tools help bring more information, in more useful formats, to the attention of personnel so that they can use their own judgement more effectively.

A third set of potential applications involves using cognitive analytics to augment the judgement of staff members by providing them with recommendations and suggestions based on extensive research on how the options being considered in a situation are likely to produce positive or negative outcomes.

Cognitive tools would be used to conduct research for identifying new practices and policies based on analyses of a broader cohort of information and outcome data. Until new CCWIS-compliant systems are procured, built and deployed, which will take a significant amount of time, a huge percentage of data will remain in legacy SACWIS systems – data that is generally not being accessed for analysis and research because it is unstructured. But it could be used in potentially unprecedented ways with cognitive computing, which can "read" unstructured data and – through natural language processing and graphical visualization capabilities – can capture much more of the available information from all sources; it can then develop powerful knowledge models that can generate weighted and ranked recommendations for decision-making purposes. Generally, cognitive systems are more reliable with a broader and deeper body of knowledge to draw upon for conducting analyses and pattern identification.

Child welfare organizations typically have a great deal of information within their own systems and, most often, they also have access to information from their contracted service providers. SACWIS systems contain case history data, as well as case notes, that generally begin when a report is made about suspected abuse or neglect, and often end when a case is closed. A good deal of the information about what happens in a case is recorded, but it's usually less about outcome measures (how well the child and family are now doing) than about process measures; that is, various data may be entered about the stage the case has reached, but the evidence of a child's well-being or ability to succeed after the case is closed may not be recorded in the child welfare system, making it hard to gauge the impact of the interventions that were provided.

In addition, the agency's records may not contain relevant information about the factors that led up to maltreatment, because they occurred before a family became "visible" to the child welfare system; or about what happened to the child and family after the agency's involvement ended. That information may exist in school, juvenile justice or other systems, however. Access to it by cognitive tools could help child welfare workers by developing a model of what impact various interventions might have; the workers could then make better-informed determinations about what services are needed and about genuinely useful outcome measures, for instance, the educational attainment, successful entry into the workforce, avoidance of justice system involvement or recidivism of youth who age out of the system. Information from outside the child welfare system would be very useful if the goal is to more-fully identify factors that could be addressed in a population to prevent the likelihood of the occurrence (or recurrence) of abuse or neglect. Similarly, data about a child's subsequent successes or setbacks involving school, work and/or criminal justice presumably would provide invaluable insights into the ultimate impact of various interventions.

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Cognitive computing tools are particularly useful in performing these types of data collection, analyses and research functions. They can consume and build an understanding of information not normally available to other analytical tools, most pointedly including the unstructured data from sources such as research reports and journal articles, text books, case notes, audio and video files and social media. Cognitive tools can also help translate data into standard, easy-to-use formats drawn from a potentially vast number of disparate sources of information that are likely to be included in a public health approach to such research. In addition, the pattern-recognition and knowledge-model creation tools of cognitive computing can be used to test hypothetical conclusions against existing and new data, thereby enabling workers to make better-informed judgments by "ranking" the probability for success of each of their options. Examples of possible solutions that could be useful to child welfare through this type of research include the following.

Child to Placement Process

Among the most important decisions agencies make is choosing placements for children in their custody after separation from their families. More evidence-based guidance relating to this highly sensitive process could improve the outcomes of such placements. Here, again, the benefits could be substantial if patterns could be found in the data pointing to how to better coordinate child characteristics (or other factors such as birth family traits or reason for removal) with specific foster or adoptive parents, or specific types of parents. A related analysis might identify the types of training and/or support for both the child and the resource family that could increase their prospects for success, again enabling workers to make better decisions. Given that placement with kin is often the first choice, cognitive tools might also be useful for locating relatives who are not yet known to the agency or who have not been identified by already-identified members of the child's family.

Staff Selection

High staff turnover is hugely disruptive to child welfare operations. Using cognitive computing to develop better recruitment practices (akin, for instance, to the way it's done on sites like Match.com) could be beneficial for identifying key traits, skills and other characteristics of successful social workers; it could also provide insights into job applicants' willingness and/or capacity to meet the challenges of working in the field. Likewise, it would be valuable to identify other factors that influence employees to stay, such as management approaches, training, matching of personnel characteristics with case types, more-equal allocation of clients by the likely workload that would be involved in each case, and other actions within the agency's control.

Case Assignment

Improving the assignment of appropriate staff to particular clients potentially could improve success rates, employee retention and client compliance. The same could be true for distributing workloads more effectively and equitably by identifying higher-intensity or more time-consuming cases. Such improvements in case assignments would require a cognitive analysis to discern significant characteristics and identifiable patterns, based on the levels of success achieved with each type of case/family and on staff performance histories and personality characteristics.

Guidance for Keeping a Child at Home, Removal and/or Reunification

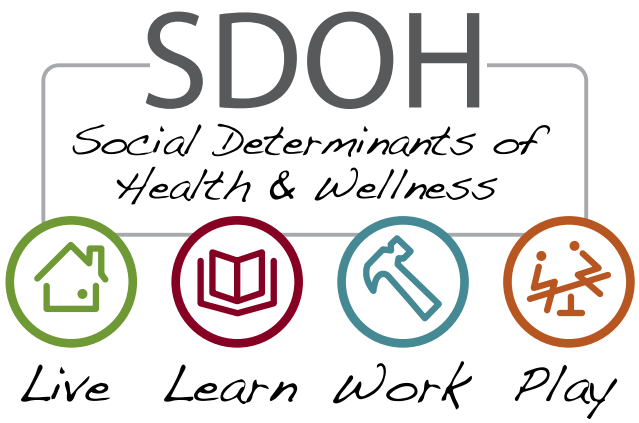
Removing a child from a family has huge consequences for all concerned, so agencies and courts work hard to avoid taking that step. They therefore could benefit from more and better information about the factors that lead to removal and the factors that can mitigate the possibility of it, or at least decrease the length of stay in foster care. Child welfare officials need to know as much as possible about whether various interventions, services or supports can keep a family intact or, at least, lower the chances that removal will be required. Similarly, more evidence would be valuable for determining the prospects for and elements of successful reunification. Cognitive tools, abetted by solid research and evaluation, could advance the state of the art in all of these regards.

Case Decision Support

As workers evaluate their cases and make decisions about how best to intervene, cognitive computing models could help evaluate the options available to them and rate each one on how likely it is to produce positive outcomes for a specific client or family. The rating of each option would be based on the research and training invested in the tools. A key requirement for child welfare services is concurrent case planning, the constant tracking and evaluation of available intervention options so that, as events proceed, the worker is always prepared with appropriate potential responses for each case. The ability to thoroughly perform this function would be greatly enhanced by the speed with which cognitive tools could be constantly reviewing open placement slots, available after-school program spaces, family eligibility for useful benefits, and all the other potential resources that might be available for every case in a workload. The system could analyze the potential positive impact of each resource for each case, and then bring new options to a worker's attention when they became available or appropriate

Wider Scope and the Role of Social Determinants of Health

While this white paper focuses primarily on the potential uses of cognitive computing for child welfare, it is critical to point out that the field does not operate in a vacuum and cannot accomplish its goals on its own, no matter how efficiently or effectively it works. Rather, child welfare operates within a larger ecosystem that includes healthcare, social services, public health, education, housing, food and nutrition, justice and other programs. So it is important to focus on this larger context, too, if the bottom-line intent is to protect children and strengthen families. Achieving that objective would require transforming child welfare from its current role, which focuses overwhelmingly on addressing problems after they arise, to working cooperatively with other sectors to identify at-risk children and families before the problems arise – and to help them succeed and thrive.



One approach to reframing the child welfare discussion in this direction is to focus more overtly on and include the Social Determinants of Health and Wellness. Improving living conditions, educational attainment, economic opportunity and safety, among other social elements of daily life, is of paramount importance for broadly improving outcomes. Indeed, it is now broadly acknowledged that the Social Determinants account for as much as 80 percent of people's health outcomes[26]. Nevertheless, most attention and expenditures go to their more-narrowly-defined medical needs. The Social Determinants have therefore become a priority for the federal government and the healthcare industry, due in large part to the continuing rise of costs in this realm.

A recent Robert Wood Johnson Foundation (RWJF) report[27] describes many of the healthcare industry's initiatives to improve its outcomes and lower its

overall costs by leveraging the billions of dollars spent annually on social and human-service programs. (Specifically, to achieve the greatest impact, the goals are to encourage prevention, reduce hospital re-admission, improve service quality and lower costs; all of these are components of the Federally Recognized Triple Aim, a framework developed by the Institute for Healthcare Improvement that describes an approach to optimizing health system performance[28].) Interestingly, RWJF's report echoes the one by the Fatalities Commission in stating that there is inadequate research on what works and does not work.

The need for a public-health-type scope of research is identified by the healthcare industry as a way to define what the social needs are of its patients; which external organizations could be useful as partners to address those needs; and how they should work together to improve the social and healthcare status of common clients. Both the healthcare and social program sectors could benefit from research that maps possible collaborative strategies across service sectors, enhancing their ability to deliver consumer-centric and outcome-driven results. Such strategies could replace current approaches, which too often are isolated, duplicative and wasteful. The resulting enhanced effectiveness of social programs could very well result in substantial improvements in healthcare outcomes and lower costs, while also likely fueling progress in other areas such as rates of incarceration, employment, self-sufficiency and other outcomes of more-stable families beyond the scope of child welfare[29].

Given the large number of organizations and care-management resources focused on helping families involved in child welfare, better coordination presumably would improve efficiency and effectiveness in many ways. Cognitive computing could help identify service gaps, avoid duplication, and help construct a more-complete picture of relevant events and circumstances before problems arise, or at least when they are in less-intense stages. Doing this well would require solid information about what works best, but the knowledge to provide such guidance is currently lacking. Conducting research to determine a hierarchy of what critical information should be shared would be extremely useful, and would help fulfill CCWIS' goal of improving "outcomes for children and families by promoting collaboration and service coordination with other programs." There is limited research about how to achieve better outcomes through coordinated and collaborative services, however. Cognitive-based research could significantly assist in changing this reality, because of the technology's ability to access the vast amounts of information (particularly unstructured data) that has previously been inaccessible to researchers.

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Child welfare officials, and many others, have come to accept that information exchange across organizations is important to achieve. But that has not yet been achieved, although many states are on the path toward doing so and have requested funding through the federal Advanced Planning (or Implementation) Document. The financial incentives (90% FFP) and cost-allocations waiver (OMB's A-87 Cost Allocation Exception) make it attractive for states to build systems and tools that enhance information-sharing and interoperability among health and human service programs. Programs that can leverage this investment, in partnership with Medicaid, include Temporary Assistance for Needy Families, the Supplemental Nutrition Assistance Program, the Low Income Home Energy Assistance Program, and child welfare and child support, among others. The intention of this initiative is clearly identified in the "Additional Guidance to States on the OMB Circular A-87 Cost Allocation Exception" funding extension, published on July 20, 2015:[30,31]

The federal rules guiding CCWIS[32] also strongly urge bi-directional data exchanges among child welfare agencies and many other organizations, with the

primary aim of encouraging and enabling better care coordination. The rules state that "the proposed bi-directional data exchanges are essential" to:

- Support the efficient, economical, and effective administration of the titles IV–B and IV–E programs;
- Improve outcomes for children and families by promoting collaboration and service coordination with other programs;
- Gather comprehensive data on client histories, needs, and services; and
- Eliminate duplicate work and service delivery across programs.

Broad-scale, public-health-type research using cognitive computing tools would help organizations identify the most-salient conclusions needed to improve outcomes and to make those insights available for use by caseworkers in the field. It also could inform the types of information-sharing and collaborations needed for jurisdictions to justify creating data exchanges, service-coordination agreements, new policies and specific programs. In addition, such research would help define what types of data-sharing and coordination are most productive, policy and legal implications, timing considerations and other factors. Cognitive computing could be very useful for overcoming the obstacles to integration and delivering the value that the supporters of interoperable, integrated and consumer-focused health and human services systems desire. It is possible that funding for such research could be covered under the OMB's A-87 Cost Allocation Exception and be reimbursed by federal funds at 90 percent, if it could be demonstrated that cognitive computing investments would improve service coordination and benefit the Medicaid Agency and overall operations.

Child welfare cannot operate alone to accomplish its broader mission. In almost all cases, other individuals and organizations already have encountered the clients being served. So, in the same way that providing help to children and families is necessarily a collaborative effort, the drive to improve organizational efficiency and effectiveness must also be collaborative. Even if child welfare officials decided today that they wanted to utilize cognitive computing, they could not realize its full value unless other players in the broader health and human services ecosystem also participate.

Possible Directions for the Road Ahead

The potential value of cognitive computing tools appears to be significant for child welfare, as well as for a broader set of health and human service organizations motivated to share data and develop evidence-based tools to improve guidance, processes and outcomes. As has been the case in the healthcare sector, a substantial investment may be required to enable some of the more-complex applications, but much more modest funding seemingly would be needed to launch other applications. Based on the Stewards of Change Institute's research for this white paper, there appear to be several potential strategies for securing sufficient support for the testing and initial uses of cognitive tools in the latter category, which could yield significant short-term benefits.

We are confident that cognitive computing will indeed be tested in the child welfare field in the near term, in some form. Indeed, there is already high-level interest by many organizations that need new ways to improve practice and outcomes. Some early adopters within government, philanthropy, industry and/or the nonprofit community will see the potential value and make commensurate investments to support pilots. However, as with any new technology, the rate of progress will depend on how many early investors there will be in near-term projects, with the expectation of achieving a meaningful return. Of course, there are also risks in not taking action to remedy current problems in child welfare, so investments to deal with those problems will inevitably be made; the question is how, when and where those investments will be

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made. Some organizations could decide to pilot cognitive computing sooner rather than later simply because their current tools aren't working well enough and they are running out of time and alternatives – or are mandated to make changes (such as by CCWIS) that could be assisted by cognitive computing. The path forward may include a variety of approaches, including:

- Early adopters/entrepreneurs from the nonprofit community or in partnership with philanthropy, innovative government organizations and/or industry could choose to pilot applications to improve their results and gain completive advantage.
- State or local child welfare agencies with visionary leadership could attempt to achieve results that are unattainable with current technology, either on their own or in partnership with philanthropy or industry. They would likely solicit competitive proposals.
- Collaborations among state health and human services agencies/departments could pilot and test more-sophisticated solutions that address the challenges and opportunities of the Social Determinants. These potentially could be funded through the A87 cost waiver and reimbursed with 90 percent federal funds.
- Public-private partnerships could be formed to accelerate the cycle time to pilot, refine and scale solutions, with fewer constraints such as competitive bidding and governmental procurement processes. The partners could include foundations, industry advocates and/or businesses seeking innovative solutions and market advantage.
- Consortia of universities, philanthropy, nonprofits and/or government could fund testing and validation studies for more-complex research and applications that could be built once and reused broadly.
- For-profit and nonprofit technology companies could fund solutions to demonstrate applicability and utility based on their own assessments of the potential return on investment.
- Federal agencies could issue competitive or cooperative grants to fund the testing of next-generation technology tools, include cognitive applications, to assess and demonstrate outcomes. Incentives could be offered through new CCWIS regulations to encourage innovative technology, similar to the Medicaid Information Technology Architecture (MITA) funding requirement.
- ACF could encourage greater investment by vendors in these areas by working to enhance the CCWIS procurement guidelines to provide incentives for solutions that include research-based decision-support capabilities to improve agency performance and family outcomes.
- Impact investments (pay for performance or social impact bonds) could be designed to attract developers to create and test solutions with market incentives.
- The prospective revenues from the sale of CCWIS solutions and associated cognitive decision-support tools could attract vendors to invest early to gain competitive advantage. Vendors could also employ cognitive tools to evaluate the outcome data within the SACWIS/CCWIS systems as part of those offerings.

It is unclear, of course, whether any of these scenarios will materialize or others will emerge. Nevertheless, given the pressing need in child welfare for better knowledge, tools and outcomes, we are confident that cognitive computing will be piloted. As stated earlier, the only questions are by whom, how extensively and when.

Key Findings

From the commissioner level to caseworkers, child welfare personnel generally agree on the principal issues that need to be addressed in order to improve their agencies' performance and their clients' outcomes. These include:

- A dearth of evidence-based approaches for executing a spectrum of activities, from elements of staff selection and child safety to improving the placement of children with families, among others.
- Having access to technologies and tools that enable better use of existing or new information sources to more accurately assess risk, learn from rich case histories about clients, and analyze disparate data sets to identify patterns and insights to provide assistance to workers and supervisors.
- Too-high caseloads and too-frequent employee turnover, resulting in workers who often are overloaded or do not have sufficient experience or knowledge about important policies and practices.
- An inability to readily obtain information that is pertinent to specific cases and/or that would facilitate staying current with policy and practice, across sectors and jurisdictions.
- Too-few opportunities to leverage the subject matter expertise and/or the specific skills of highly experienced workers to expedite the training of newer workers.

Cognitive computing appears well-suited to address these and other issues in child welfare by improving educational opportunities, understanding what works best, and providing guidance for better decision-making.

Recommendations

Based on our literature review, roundtable discussions and other research conducted for this white paper, the Stewards of Change Institute has developed recommendations that include:

- Public and nonprofit child welfare agencies should begin piloting cognitive tools as soon as practicable to help solve immediate problems. Some of the short-term applications could include: expediting the gathering of case history information from legacy systems; speeding up information retrieval for case review, reporting or court submissions; and expediting access to organizational policies, procedures and regulations that guide decision-making processes.
- Prospectively, agencies should develop plans, and potentially requirements, for more-extensively incorporating various cognitive computing tools into existing systems or future procurements.
- In states where sufficient resources are available, scalable models should be created in collaboration with universities and philanthropy to accelerate the development, testing and dissemination of effective solutions that could benefit the broader child welfare community. More research-based models could potentially provide decision support assistance for issues such as determining "best fit" for placing children in foster families, guiding intervention decisions for caseworkers based on outcome research, and pointing to more effective collaborative case strategies with other agencies.
- Federal officials, foundation leaders, research institutions and cognitive computing vendors should convene to shape how they will share the responsibility for sponsoring and funding pilots, as well as research and analysis that are needed to adapt these decision-optimization tools for use

within child welfare. Similarly, they should outline procurement guidelines to ensure that new system investments encourage the use of these tools.

- Governmental, academic, foundation and possibly vendor representatives should form a consortium to underwrite research and implement findings on how best to use cognitive systems for enhancing case management, training workers and improving policies, practices and outcomes in child welfare.
- The research suggested above should be broadened to include the many other agencies servicing common clients and, ultimately, to determine how best-integrated and consumer-focused health and human services could operate. The researchers' work could also be enhanced by cognitive computing.
- HHS leaders from government, academia, philanthropy and industry should convene to explore how cognitive computing could help devise and implement programs that more-effectively include the Social Determinants of Health and Wellness as a means of helping reduce healthcare costs, among other positive consequences. Increasing the impact of existing human services spending is likely the largest near-term benefit of reducing the demand for healthcare and bolstering its effectiveness, given that an estimated 80 percent of health outcomes are attributable to the Social Determinants.

Conclusion

Cognitive computing already is transforming many industries[33, 34, 35]. The market for its tools is projected to grow by 33 percent annually and reach nearly $14 billion in revenues by 2020[36]. While this promising technology is being applied most extensively in commercial realms such as finance, travel, manufacturing, driverless vehicles and consumer products, it is also being successfully implemented in healthcare, which is closer to human services in its design and functionality. It seems clear that cognitive tools could meaningfully improve operations and outcomes in child welfare and, more broadly, across the HHS ecosystem. Gaining these broader, optimizing benefits would necessitate far more collaboration than has historically occurred, however. Research could help move us in this direction by identifying how relevant fields could collaborate and what the benefits would be.

The application of cognitive tools to child welfare also would require various levels of short- and long-term investment to develop applications, train systems and develop models that could increasingly assist practitioners in unique, meaningful ways. A number of possible funding scenarios are envisioned in the section above by which federal, state and local governments, nonprofits, foundations, academia and industry might initiate action.

The Stewards of Change Institute has concluded that cognitive computing could be a transformative technology for the child welfare field. It could be used to unlock, access and analyze troves of information locked in legacy systems, which could then be used for better real-time, data-driven decision-making.

As a result, organizations could enhance their ability to improve the lives of children, families and communities. Given the current state of child welfare in the U.S., we suggest that leaders, advocates and researchers begin piloting solutions using cognitive tools to assess and demonstrate their efficacy and utility. We will remain engaged in this effort and will report periodically on the progress of cognitive computing in child welfare and related fields.

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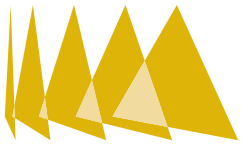

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