LESSONS LEARNED ON USING DIGITAL TOOLS TO IDENTIFY RISK FACTORS ASSOCIATED WITH CHILD WELL-BEING OUTCOMES

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Abstract

Reliable real-time data is essential for monitoring and estimating child well-being outcomes and is also critical for planning interventions that cater for children's needs. The Child Well-being Tracking Tool (CWTT) is a digital tool designed to monitor and identify risk factors associated with child well-being. It was developed for a Communities of Practice for Social Systems Strengthening study involving 249 early grade children in Johannesburg's poorest areas and in a rural community of Moutse. Data was collected from children, caregivers, teachers, and nurses, covering six well-being domains (health, nutrition, economics, education, protection, and psychosocial health) at three different time points. The CWTT synthesized data to provide well-being scores and identify vulnerable children who were then referred for interventions. Despite challenges in tool design, data collection, integration, visualization, and privacy protection, the CWTT successfully assessed child well-being longitudinally. By offering real-time data access, the tool can improve service delivery and integrated care, potentially leading to better child well-being outcomes.

Introduction

Digital tools have transformed the way we collect and utilise the data and offer opportunities for collaboration in improving research (Ellis et al., 2021). Digital tools refer to the software applications that can be used to identify, track and manage risk factors and illnesses to promote health and well-being (Dhingra & Dabas, 2020; Ronquillo et al., 2022). The use of digital tools cuts across various sectors such as health, welfare, education and infrastructure. For example, in the health sector, digital tools have been shown to enhance patient management by enabling the identification, tracking, and management of risk factors, ultimately promoting health and well-being and improving patient outcomes (Lee Ventola, 2014). Previous studies have demonstrated the effectiveness of digital health tools in delivering services, both in the short and long term, as well as in strengthening national healthcare systems (Al-Shorbaji, 2022; Orton et al., 2018). Furthermore, individuals have utilized digital tools to proactively manage their health, tracking metrics such as fitness levels, weight, and blood pressure (Gao & Lee, 2019). In the transportation sector, digital tools have enhanced road safety by providing efficient and reliable real-time data for monitoring road conditions and traffic patterns (Taber et al., 2020). Drawing on various expertise from global and country specific indicators and other research conducted in HIV/AIDS and education, the strength of digital tools lies in their ability to collect wide-ranging data in a short space of time (Law et al., 2018; Nucita et al., 2009; Williamson, 2016). This digital approach offers the potential for cost reduction compared to traditional paper-based data collection, which is often time-consuming and resource-intensive, especially for large-scale surveys like national censuses (Ghimire & Treleaven, 2021; International Labour Organization, 2021). While digital tools offer innovative solutions and efficient programs for monitoring progress in social indicators, their implementation in low- and middle-income countries (LMICs) is often hindered by limited access to affordable and innovative information technology infrastructure necessary for large-scale data collection (Labrique et al., 2018).

Although the use of technology in measuring health and wellbeing is not uncommon, digital tools have always been designed to improve service delivery, identify and reduce inefficiencies in health or care systems for referrals, lower the cost of healthcare services as well as provide a more personalised service for individuals or targeted populations (Haleem et al., 2021; Mosadeghrad, 2014). Recently, we have also seen a surge in the use of digital surveys used for data collection, with rising social media platforms that capture attitudes, opinions and experiences of individuals – making wide data available to understand the global social issues (Dwivedi et al., 2021; Ohme et al., 2024). However, for many policy makers and program implementers, the prevalent challenge that exist is the inefficiency in providing immediate response to unexpected emergencies such as outbreaks of pandemics, due to the delay in the data analysis and report writing (Bharosa et al., 2010; Madhav et al., 2017; Radanliev et al., 2020). Unfortunately, this is a global

problem as this challenge extends even to international organizations like UNICEF, which have encountered similar difficulties in measuring progress towards policy objectives like promoting employment, poverty reduction, and improving living and working conditions (Cummins & Huddleston, 2013).

Reliable real-time data is essential for monitoring and estimating child wellbeing outcomes and can contribute to ensuring effective delivery of interventions that can be adopted regularly to respond to the children's needs (Cummins & Huddleston, 2013; Requejo et al., 2022). This means collecting data on enough variables to make inferences of what child wellbeing means, looking at complex relationships and correlations to pinpoint the specific factors that need attention. This information will help screen, flag, inform decisions to link children to the right support services to meet their needs (OECD, 2021; Leila Patel et al., 2021). There is also a need to democratise the data to provide local service provision that could accelerate the country's need to meet the targeted global Sustainable Development Goal 3 (SDG's) of good health and wellbeing (Cheng et al., 2021). These advances in technological development do come with challenges, these include the disconnect between the software developers and the end-user in terms of ensuring the capability and functionality of digital tools to ensure the app meets the desired requirements in tracking child well-being outcomes (Iyamu et al., 2022; Iyanna et al., 2022). While the end goal for the developers, is to provide tools that are innovative, for the end user, the developed data collection tool should be user-friendly, highlight the urgent cases that need referrals and enable monitoring. Establishing a digital tool for gathering, analysing and reporting quality data takes time (Kjörk et al., 2022).

Supporting child wellbeing is an intersectoral responsibility at the individual household level, community, regional and national level. In South Africa there are currently silos between the Department of Health, Social Development, and Basic Education, in delivering services which hinders efficient delivery of the much needed care services to children (Gray et al., 2022). While in a policy such as the Integrated School Health Policy (ISHP) encourages inter-department collaboration among the key government departments responsible for children's well-being—education, health, and social development to deliver centralised child services, there is limited proof of substantial progress and challenges towards achieving this objective (Department of Social Welfare, 1997; Pillay et al., 2023; Strydom et al., 2020). The research gaps this study aims to fill is the paucity of evidence and practical lessons on how digital tools can effectively identify risk factors associated with child well-being outcomes. While the potential of digital tools in data collection and health management is acknowledged, there is a scarcity of research demonstrating their specific application and impact in identifying and tracking child well-being risks. This study aims to bridge this gap by examining the on-the-ground implementation of the digital Child Well-being Tracking Tool (CWTT), offering empirical evidence and practical lessons on its effectiveness in identifying and tracking child well-being risk factors. It aims to demonstrate the feasibility and effectiveness of using digital

tools to monitor child well-being, inform interventions, and contribute to improved outcomes for children. We take the view that early interventions tailored to children's needs in poor families in the foundation years of schooling could improve their well-being in the short to medium term with positive benefits in later life (Leila Patel et al., 2017).

Materials and Methods

Study design

A mixed-methods approach, incorporating both participatory and pragmatic elements (van Griensven et al., 2014), was employed to develop a digital tool for measuring child well-being outcomes. Through a collaborative co-design process, the research instrument was developed by the Advisory Level Community of Practice (ALCoP), a group of academic and research partners leading and managing the Community of Practice for Social Systems Strengthening to Improve Child well-being Outcomes (CoP) project.

About the CoP

The CoP project was established in 2020 as a multi- and trans-disciplinary collaborative intervention research study, funded by the National Research Foundation. The CoP model sought to address the multifaceted challenges affecting child well-being in South Africa. Through bringing together researchers and practitioners from diverse fields such as social work, sociology, psychology, education, health, and engineering, the CoP aimed to define child well-being and develop effective measurement tools. This collaborative effort culminated in the creation of a digital tracking tool to identify children at moderate or high risk across multiple well-being domains, including education, protection, food security, health, psychosocial well-being, and economic and material well-being. By focusing on individual children and their families, the CoP sought to overcome the fragmentation of services and improve coordination between health, education, and social welfare sectors, ultimately enhancing child well-being outcomes (Leila Patel et al., 2021).

Study Areas

The study focused on four sites within the City of Johannesburg: Soweto, Ivory Park, Alexandra, and Malvern. Soweto and Ivory Park are large, predominantly Black African townships characterized by low-income households. Soweto, with an area of 200 km2, is home to nearly 1.3 million residents (STATSSA, 2011). Within Soweto, two schools were included in the study, one in Meadowlands and another in Doornkop. Ivory Park, located in Midrand, has a population exceeding 182,000. In contrast, Malvern was historically an affluent suburb but has experienced socioeconomic shifts. The primary criterion for selecting these schools was their location within the poorest wards of Johannesburg,

aligning with the study's focus on understanding child well-being in disadvantaged communities.

In the rural site, Moutse was chosen as our study area. Moutse, located in a largely rural district within the Elias Motsoaledi Local Municipality, faces significant socioeconomic challenges. Despite a population of 140,000, most residents live outside the small town and rely on social grants due to high unemployment and poverty rates. The area also suffers from poor infrastructure and lacks safe water access.

Aims of the CWTT

The aim of the digital CWTT was to develop a digital online tracking tool in which fieldworkers can enter data electronically. This tool was envisioned to enable data collection for research purposes, and to be used as a monitoring tool for child-wellbeing outcomes. Findings from this digital tool would be used to provide planning for local level CoPs, which were community-based stakeholders working in schools or part of communities in which the schools were located to design intervention plans for all children identified as being high or moderate risk. In the development of the digital CWTT tool, end users were viewed as experts, therefore the tool needed to be user-friendly for use by field workers, capture data for multidimensional child wellbeing outcomes and protect personal information. In addition, on the back end of the digital tool, researchers needed access to monitor incoming data in real-time, ensure quality assurance, integrate data from different datasets, and visualize data. Ultimately, the CWTT served a dual purpose: (a) conducting risk assessments of participating children, and (b) informing the development and implementation of intervention and care plans specifically tailored for those at medium and high risk, ultimately promoting improved child well-being outcomes.
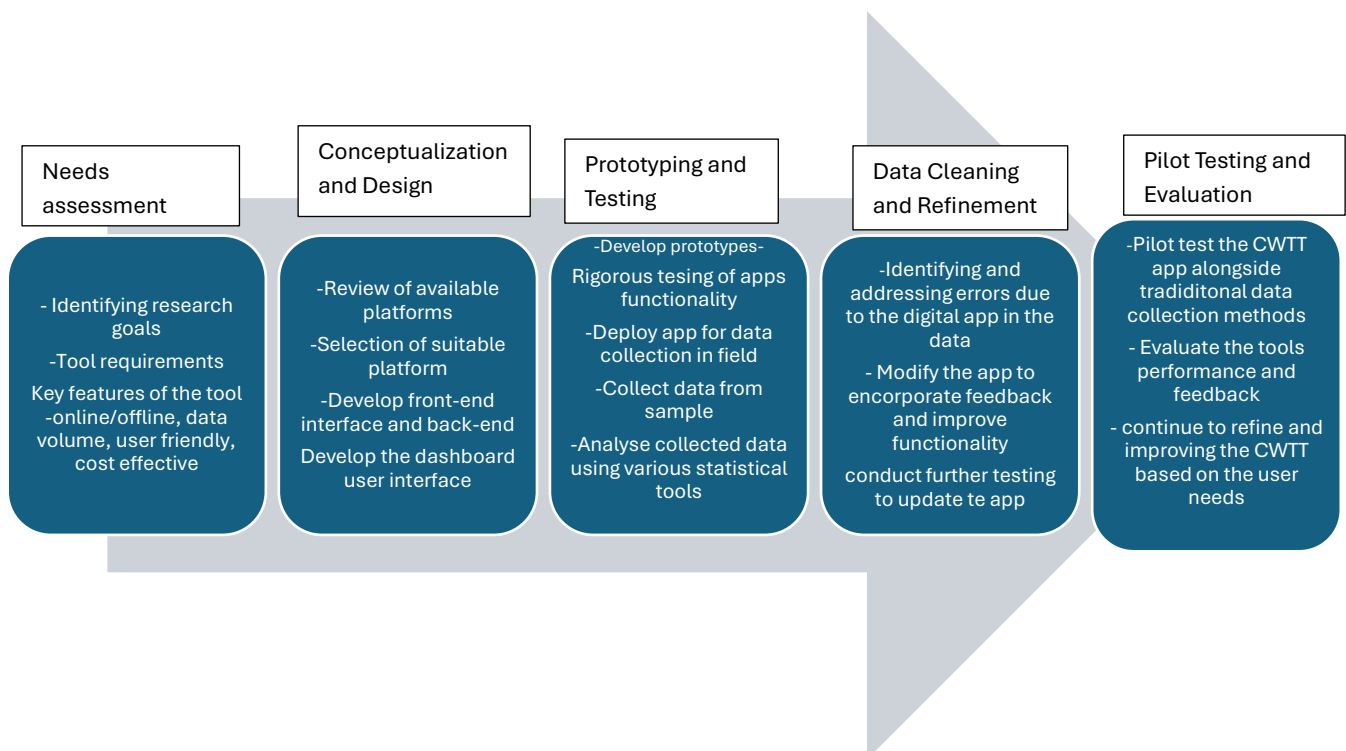
Tool development

Figure 1. Development Process of the CWTT Digital Application

The co-design process in developing the CWTT digital tool was a collaborative approach that involved the active participation of researchers, field workers and the digital applications developers team. The CWTT technology was designed and developed by a CoP partner and their team within the Engineering Management Department at the University of Johannesburg. This team possesses extensive experience in application development and data analytics, including projects involving artificial intelligence.

The digital CWTT application needed to meet specific requirements to effectively support the research goals.

These included the ability to:

- Create a digital database capable of storing information on informal addresses and photos.

- Link diverse data sets to individual children for comprehensive tracking.

- Consolidate data and enable data analytics for informed decision-making.

Key features essential for the application's success were:

- Ensure functionality both offline and online to accommodate fluctuating connectivity.

- Capacity to handle large data volumes and align data from multiple sources.

- User-friendly interface for ease of accessibility by fieldworkers.

- Cost-effectiveness to ensure sustainability within the research budget.

- The system needed to be owned by the University of Johannesburg.

Following a thorough review and analysis, the team selected Microsoft Power Apps as the optimal platform to fulfil the application requirements. They developed a front-end interface for questionnaire creation, user authentication, and a back end for efficient data extraction. After rigorous testing, the app was deployed and successfully used to collect data from approximately 162 children in the project's first phase. The digital CWTT underwent pilot testing prior to the wave 1 data collection in 2020. It was further evaluated during the first round of data collection, where both printed questionnaires and tablets running the CWTT were used to gather information during interviews. The development of the CWTT remains an iterative and continuous process, incorporating feedback and refinements based on real-world usage and emerging needs. The collected data underwent comprehensive analysis using a range of statistical tools, providing valuable insights for further research and interventions.

In the data cleaning process, several constraints were identified and subsequently addressed by the development team. The app has undergone significant modifications to incorporate enhanced functionality, including branching logic, streamlined identification with interlinking instruments, improved offline capabilities, optimized globally unique identifiers (GUIDs), and various other enhancements. The team has successfully completed phase 2 acceptance testing. The second version of the app had undergone stress testing to ensure its robustness and performance under demanding conditions and was used to collect data in the second phase of the CoP study in the rural setting.

Recruitment of the study team

Social workers were used as fieldworkers to obtain data from caregivers, teachers, and children. The fieldwork team included a Project Manager, Fieldwork Manager, and five fieldwork supervisors, seven social workers, and seven professional nursing preceptors. The Project Manager, a social worker, managed the project and supported the team in schools. In the Johannesburg schools, social workers were sourced from three NGOs and recruited for specific areas, where they could speak the local language that children in the community speak. Nursing preceptors were sourced from the University of Johannesburg to do health assessments of children. Fieldwork supervisors were temporary staff of the Centre for Social Development in Africa (CSDA) University of Johannesburg, which were familiar with the local communities. The team underwent a

three-day training workshop offered by the researchers at the CSDA, covering study aims, community overviews, the importance of multi-disciplinary collaboration, interviewing techniques, and the translation of questions into native languages. The study was conducted in schools where Sesotho, Xitsonga, English, and isiZulu were utilized as languages of communication. The CWTT digital app was also discussed and demonstrated during the training.

Participants and recruitment

The original study design aimed to select children from either Grade R or Grade 1 in the Johannesburg schools. However, data collection for the initial phase (Wave 1) coincided with the COVID-19 pandemic, during which schools implemented rotational learning schedules with reduced class sizes. This unforeseen circumstance prevented random selection of classes as initially planned. Consequently, a convenience sampling approach was adopted, with classes selected based on the original criteria of Grade R or Grade 1 enrolment. We collaborated with school principals to identify suitable classes and provided them with research information packs containing a research information sheet, caregiver consent form, and children's assent form. Caregivers who expressed interest and provided consent constituted the final sample. Data from the caregivers, teachers and children was collected by the social worker. The nursing preceptor conducted health assessments on children in the presence of their caregivers.

In Moutse, the sampling process deviated from that of Johannesburg by selecting only one school. Collaborating with the Ndlovu Care Group, we identified a Quintal 1 school, as classified by the Department of Basic Education (DBE), that primarily serves highly vulnerable children. Children in Grade R to Grade 3 who were recipients of the Child Support Grant (CSG) and who attended Ekucathuleni Primary School in Moutse were identified as the target group. Originally, our proposed sample was 60 children across the four grades – 15 children in each Grade (children from Grade R, Grade 1, Grade 2 and Grade 3). However, following a recruitment drive by the research team, caregivers who attended a briefing meeting at the school. A larger number of parents expressed interest in participating in the study. To facilitate their involvement, consent forms and information sheets were distributed to caregivers through their children. Caregivers who returned the signed consent forms were contacted and invited to visit the Ndlovu Care Group offices for an interview with their child.

The children in grades R-3 were mainly selected because they were in early childhood, which is a critical period for development, where rapid growth in cognitive, social, emotional, and physical growth occurs. Research shows that interventions and support during this stage can have a lasting impact on a child's overall well-being and future outcomes (Moore et al., 2015; Leila Patel et al., 2021).

Ethical considerations

Ethical approval for the study was granted by both the University of Johannesburg's Faculty of Humanities Ethics Committee (REC – 01-050-2020) and the Faculty of Health Science Research Ethics Committee (REC-241112-035) in March 2020. Necessary permissions to conduct research in the schools were obtained from the national Department of Basic Education, the Gauteng Department of Education's Research Office, the Department of Health, and the District Research Office. Consent to participate in the study was obtained from the six principals and each of the caregivers. Caregivers completed the consent forms in the presence of a social worker who explained the content to him/her, as well as what was required of them and their child. Social workers also discussed confidentiality and emphasised the voluntary nature of the study. Children were similarly informed and gave assent in the presence of a social worker and their caregiver. Caregivers in need were referred to local social workers for psychosocial support and access to other government assistance programs. All quantitative data were anonymised.

Results

Overview of data collection and sample

Table 1: Selected Schools for the CoP Study in Johannesburg and Moutse

Name of School	Fee-payment	Region
EkhukhanyisweniPS (Alexandra)	None-fee paying	Johannesburg Region E
Lejoeleputso PS (Meadowlands)	None-fee paying	Johannesburg Region D
Malvern PS (Malvern)	Fee-paying	Johannesburg Region F
Mayibuye PS (Doornkop)	None-fee paying	Johannesburg Region C
Mikateka PS (Ivory Park)	None-fee paying	Johannesburg Region A
Ekucathuleni PS (Moutse)	None-fee paying	Elias Motsoaledi district

In table 1 above, most (4 out of 5) schools in Johannesburg are non-fee paying, located in different communities across the city. Only one school, Malvern primary school, is fee-paying. The single school in Moutse, Ekucathuleni Primary School, is also non-fee paying.

Table 2: Percentage distribution sampled children by schools

School attended	Frequency	Percentage
Ekhukhanyisweni PS (Alexandra)	24	9.64
Lejoeleputso PS (Meadowlands)	44	17.67
Malvern PS (Malvern)	32	12.85
Mayibuye PS (Doornkop)	26	10.44
Mikateka PS (Ivory Park)	36	14.46
Ekucathuleni PS (Moutse)	87	34.94
	249	100.00

Table 2 above shows the distribution of the study participants. A total of 249 children were enrolled for the baseline study of the CoP, with Ekucathuleni Primary School (Moutse), having the highest number of children n=87, followed by Lejoeluputso, n=44. Ekukhanyisweni primary school had the lowest number of children participating in the study, n=24.

The digital CWTT application was tested and used to collect data from a total of 6 primary schools that are in low-income settings of Johannesburg and Moutse. The Child wellbeing instrument was loaded on the digital application, and it was piloted for the first time in October 2020. In Johannesburg, the tool was subsequently used to collect three waves of data among the same children. In the second phase of the CoP, the digital app was only used in one school in Moutse. Data was gathered from the parents, teachers, nurses and the children themselves. The level of risk was categorized using a colour-coded system: red signifying major concerns requiring immediate referral, amber indicating some concerns warranting support or intervention, and green representing no significant concerns.

Analysis of Well-being Data by Domain

The CWTT aimed to identify children at high, moderate, and low risk, with those in the high-risk category requiring immediate referral. Given the sensitive nature of the questions asked in the CWTT, it was determined that social workers would be the most suitable to collect data from caregivers, teachers, and children.

Although the tool collected data across multiple measures, responses were clustered to determine overall risk categories. This clustering was informed by existing literature, knowledge of child well-being indicators, and consensus among team members. For instance, a child classified as high risk for food insecurity would have responded "yes" to sleeping hungry and "no" to having enough food at every meal. Similarly, a high-risk classification in the educational domain would result from responses of "no" to attending school regularly and progressing, and "yes" or "sometimes" to being afraid to go to school. This clustering approach allowed for a comprehensive assessment of well-being across multiple dimensions.
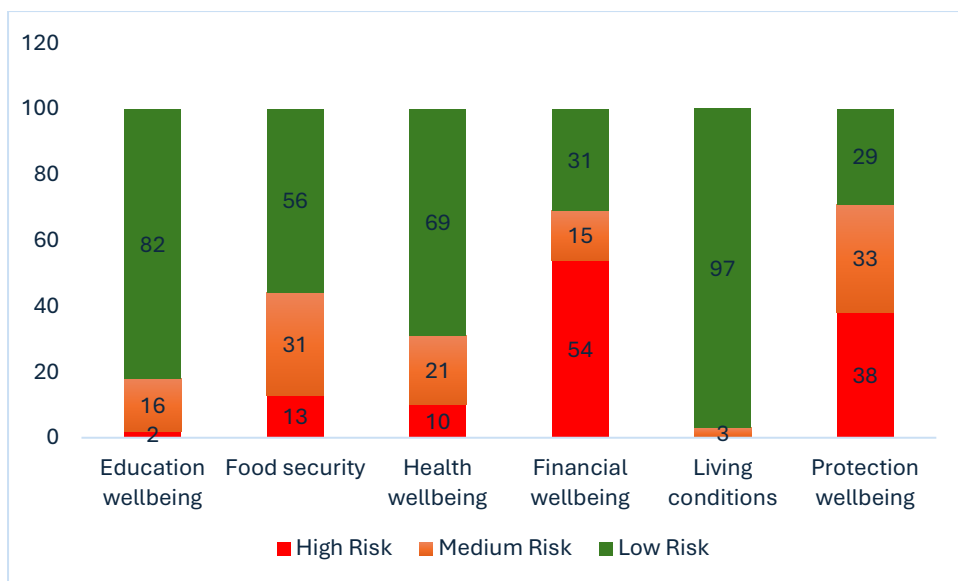
Figure 2. Risk assessment of children in Johannesburg schools

Figures 2 and 3 presents a breakdown of risk categories (high, medium risk, and low risk) across six domains of child well-being: education, food security, health, financial well-being, living conditions, and protection in Johannesburg schools and a school in Moutse. The CWTT risk assessment data reveal distinct patterns of child well-being vulnerabilities in Moutse (a rural area) and Johannesburg (an urban setting). In Moutse children face significantly higher risks in protection (48% high risk) compared to Johannesburg (38% high risk). While both regions show concerning levels of financial hardship, the risk is more pronounced in Moutse (39% high risk) than in Johannesburg (54% high risk). Both study areas exhibit similar levels of high risk in health well-being (10% in both areas). However, food insecurity is a more pressing issue in Johannesburg (13% high risk) compared to Moutse (6% high risk). Both areas show relatively lower percentages of children facing high risks in education and living conditions.
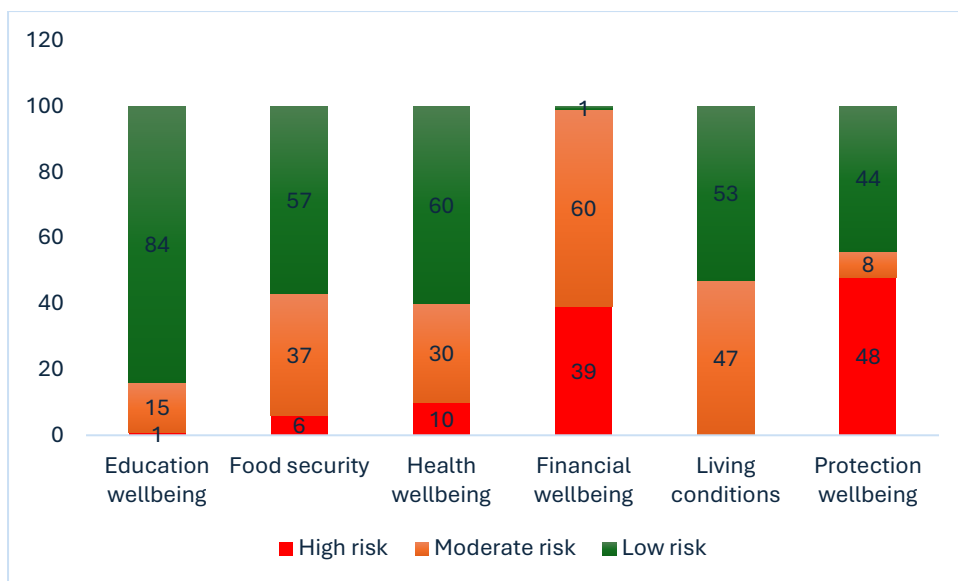
Figure 3. Risk assessments of children in Moutse, Limpopo province

Impact of the CWTT Intervention

The digital CWTT was used as an assessment tool to inform care, developmental assessments and interventions. For children identified with high-risk factors, interventions were individualized based on their specific needs. The CoP study implemented cross-sectoral interventions, integrating support across health, education, and social welfare sectors, with the aim of enhancing child well-being outcomes. The intervention was implemented and concluded over a two-year period (2020- 2021) in Johannesburg schools and in 2024 from March until May 2024 in the Moutse school.
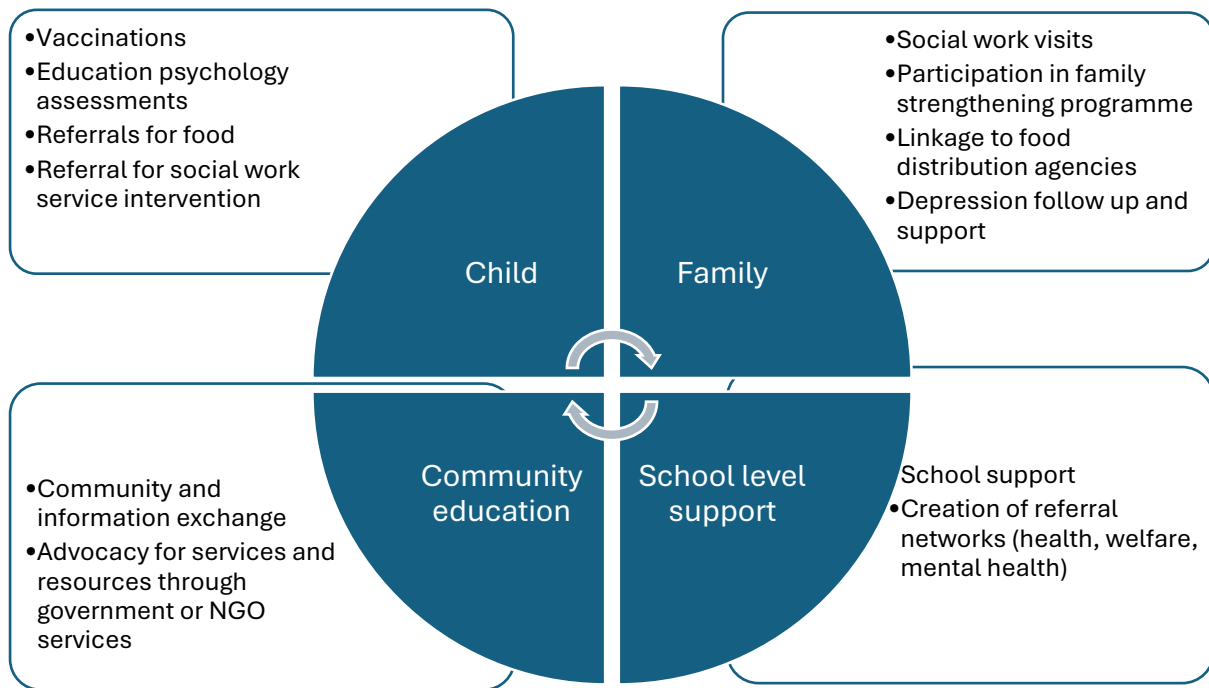
Figure 2. Multi-sectoral Interventions for At-Risk Children: A School, family and Community Approach. (Source: Adapted from Patel et.al.,2022).

The interventions detailed in figure 2 primarily focused on immediate needs of at-risk children and their families. This included prompt identification and referral of children at risk, addressing critical issues such as food insecurity and health concerns, and ensuring child safety through home visits. Additionally, the interventions targeted learning challenges by providing necessary support and helped caregivers in terms of mental health and economic well-being. To complement these direct services, the programme also invested in building community capacity through education, advocacy, and school-based support systems.

Challenges, mitigation strategies, and lessons learned in using digital tools to monitor child wellbeing

Data privacy and security

The CWTT worked with highly sensitive information of children and their families. Therefore, security to protect this sensitive information was crucial. In the development of the digital tool, robust data protection measures were put in place, which included restricted access through the provision of login details and passwords to field workers, limited access to data files and anonymization when sharing the data with external stakeholders. Fieldworkers had to sign in to the application, and all the data collected could be linked to the field workers who collected the data.

Data quality and reliability

To ensure data quality and reliability, when the tool was first piloted in 2020, there was a dual use of the paper-based questionnaire as well as the digital application. The paper-based data collection was used as a backup in cases where there were system challenges, such as bugs, system failures, which resulted in data loss. To mitigate the issue of system failures, data was moved from the local drive and backed up to the azure cloud services to prevent data loss and system failures.

Technical issues

Another challenge experienced during the pilot included maintaining data accuracy and consistency when the data was captured. This means that field workers could enter responses not relevant to the question. To mitigate this challenge, there were systems incorporated in the digital application. For example, one could not enter text in a field that was numeric. We also included functionality such as dates, which would enable the field worker to select the date rather than type it in, which was a strategy that prevented errors from being captured.

We also faced challenges of the digital divide, where some of our field workers experienced challenges with using the digital application to collect data. Some errors on the data were not system but rather user related. To mitigate this challenge, training and support were provided to our staff to improve digital literacy.

Lessons learnt

The effectiveness of digital tools is significantly influenced by contextual factors. Urban areas generally possess more developed digital infrastructure, such as reliable internet connectivity, facilitating the continuous use of digital tools. Conversely, rural areas like Moutse often encounter connectivity challenges. While the CWTT digital tool employed in this study offered offline data collection capabilities, mitigating some of these issues, such as the intermittent nature of internet access due to load shedding posed substantial disruptions as sometimes filed workers did not have power for two-5 hours. Fieldworkers required online access to initiate data collection sessions, and extended power outages frequently interfered with scheduled interviews, impacting data collection efficiency and potentially compromising data integrity.

The analysis of the data collected using the CWTT digital tool identified children at high and moderate risk. This was the crucial first step in delivering effective interventions. This demonstrated the potential of digital tools to streamline the process of needs assessment and prioritization of services, enabling timely and targeted support to improve child wellbeing outcomes. While the flagging of children with high or moderate risk was made possible using digital tools, it's essential to note that digital tools are most effective when integrated into a comprehensive system of care. Thus, the digital CWTT facilitated identification, however, the subsequent interventions – such as food provision,

health, and protection services – required service referral and the participation of active stakeholders on-the-ground to mobilise resources to improve child wellbeing outcomes. Therefore, a combined approach leveraging both technological advancements and human expertise is crucial for achieving optimal child wellbeing outcomes.

Data privacy and security are paramount when using digital tools to collect sensitive child information. In South Africa where the POPIA (Protection of Personal information) Act is active, it means we needed to develop data sharing protocols and user agreements to ensure robust measures are in place to protect children's data and prevent unauthorized access.

Another lesson learnt was that it was crucial to have a continuous evaluation of the digital tool to ensure its effectiveness and relevance. We have already tested the tool in five Johannesburg schools across three waves, as well as in one rural school. Regular assessment of the tool's accuracy, usability, was instrumental in refining and improving the tool. This has also improved how well we assess child wellbeing.

We have also learnt the importance of building digital literacy among fieldworkers using the digital CWTT tool, to ensure smooth implementation in data collection. The training and support provided to fieldworkers involved training on administering the digital tool, feedback on the output of the data collected and retraining on the common errors made during data collection. Feedback meetings were also called, where field workers were invited to see the output of the results to maximise the tool's potential, harness the power of technology and enhance child outcomes.

Discussion

A primary focus of this study was to present the practical lessons on how digital tools can effectively identify risk factors associated with child well-being outcomes. To achieve this, the Community of Practice on Social Systems Strengthening study (CoP) was initiated which was a multidisciplinary team, bringing together researchers and practitioners to formulate what would constitute child wellbeing outcomes. An assertion is made that people in community of practices collectively learn together, bringing their different interests and backgrounds to solve a problem or come with innovative solutions to solve the problem (Cundill et al., 2015). Through this collaboration, the CoP partners were able to develop a child wellbeing tracking tool. With the help of the engineering team, a digital tool which was developed which would be used as a platform to collect data which can be analysed to do risk assessments and monitor child wellbeing.

From our findings, it was clear that the use of digital tools in a rural and urban schools presented with a number of challenges and lessons learnt. The findings from this study underscore the potential of digital tools, specifically the Child Well-being Tracking Tool (CWTT), to identify and address the complex needs of children in diverse settings. By

effectively capturing data on multiple well-being domains, the CWTT enabled a comprehensive assessment of child vulnerabilities in both urban and rural contexts. The identification of the risk profiles in Johannesburg and Moutse highlights the importance of tailoring interventions to specific children's needs. A study by Cullen and colleagues has pointed out that the use of digital tools highlights that using digital tools can provide evidence, with the aim that helps decision making and risk mitigation, resulting in improved quality of life and health promotion among children and their families (Cullen et al., 2024).

The CoP study emphasis on cross-sectoral collaboration is crucial for maximizing the impact of interventions. While both Moutse and Johannesburg exhibit substantial child wellbeing challenges, the specific areas of vulnerability differ, for example, in Moutse children show the high risk in the protection domain, while in Johannesburg children were more vulnerable to financial hardship and food insecurity. Findings from the country's statistical agency highlight that multidimensional poverty is higher among children in rural areas compared to children in urban areas (STATSSA, 2020). In another indicator such as educational outcomes, differences in the urban-rural gap are stronger based on the family characteristics rather than the school characteristics (Sumida & Kawata, 2021). This finding suggests that while school quality in urban and rural areas is essential, improving school infrastructure or teacher training alone will not suffice to close the rural-education gap but interventions should focus heavily on supporting families. By integrating health, education, and social welfare efforts, the CoP model demonstrated the effectiveness of a holistic approach to child well-being. Ongoing communication, feedback, and collaboration between families and professionals is necessary to ensure interventions are meeting children's evolving needs (Haffejee et al., 2023; Patel et al., 2022).

The challenges encountered in data privacy, security, and technical implementation emphasize the need for ongoing refinement and adaptation of digital tools to meet the evolving needs of child welfare programs. Robust measures initiated in this study such as restricted access to the digital application, data anonymization when sharing the data, and adherence to POPIA were implemented to protect sensitive child information. Studies have found that dealing with sensitive information encountered in child welfare requires collaboration and cross-system sharing. Therefore, a siloed approach in child welfare can impact on children and families who face multiple vulnerabilities in areas such as health, housing and education. Data sharing can thus open a broader continuum of childcare and family support (Beard et al., 2020; Campbell et al., 2020; Darlington & Feeney, 2008). The findings highlight the importance of a balanced approach that leverages both digital tools and human expertise to effectively measure and improve child wellbeing outcomes. While digital tools offer significant advantages in streamlining data collection, analysis, and needs assessment, they are most effective when integrated into a comprehensive system of care that prioritizes human interaction and

relationship-building.

Our findings show that data quality and reliability were ensured through the combined use of paper-based questionnaires and digital tools. Cloud-based data storage further enhanced security. While offline data collection capabilities mitigated internet connectivity challenges in rural areas, frequent power outages disrupted data collection and the field work scheduled, as some appointments needed to be cancelled. While the use of the paper questionnaire was seen as a backup, studies have shown preference towards digital applications, with an argument that electronic devises such as tablets improve the cost-effectiveness and quality of data collected compared to the standard paper data collection (Al-Shorbaji, 2022; Chaudhuri et al., 2022; Zeleke et al., 2019). Furthermore, the study highlights the importance of addressing digital disparities. Ensuring equitable access to digital tools and training is crucial for maximizing the benefits of technology across different communities. This was facilitated through training and support of field workers on digital literacy, which served as an advantage in mitigating user-related errors. By investing in digital literacy and infrastructure, programs can enhance their capacity to use data to inform and improve child well-being outcomes. Thus, continuous evaluation and refinement of digital tools is necessary to ensure they remain relevant, user-friendly, and effective in supporting child wellbeing.

In conclusion, this study provides valuable insights into the potential and challenges of using digital tools to monitor and improve child well-being. By offering real-time data access, the tool can improve service delivery and integrated care, potentially leading to better child well-being outcomes. Building on these findings and addressing the identified limitations, policy makers, researchers and practitioners can contribute to the development of more effective and equitable child wellbeing and care systems.

Future research should explore the long-term impact of the digital CWTT on child well-being outcomes, as well as the cost-effectiveness of using digital tools for to deliver interventions and services that children need. Integrating digital tools into existing service delivery systems requires careful planning, training, and support to ensure smooth implementation and avoid overburdening frontline workers such as teachers and social workers.

Data availability statement

The community of Practice data will be made available upon request.

Biographical notes

Dr Matshidiso Sello is a researcher at the Centre for Social Development in Africa (CSDA). She is a trained demographer. Her research interests are in investigating the multifaceted factors that influence child health and wellbeing outcomes. She has an unwavering dedication to advancing knowledge and making a significant contribution in doing research to improve child health, child nutrition, food security, maternal health and social development.

Professor Lauren Graham is a development sociologist who maintains a deep commitment to social justice. As an academic, her work revolves around understanding how to enhance opportunities for individuals to realise their full capabilities. Lauren's research has predominantly concentrated on marginalised and excluded groups, encompassing unemployed youth, individuals with disabilities, and children growing up in adverse circumstances. While her focus lies in the scholarly pursuit of conceptualising and executing research for theoretical advancement, she is equally interested in employing evidence to devise innovative solutions that advance improved social development outcomes for disenfranchised segments of society. Consequently, her work is intrinsically applied and pertinent to policymaking.

Professor Leila Patel is a distinguished professor of Social Development Studies. She has published widely on issues of social development in South Africa and internationally. She is a B2 rated researcher of international standing in her field. Her research interests include social welfare policy, social protection, socio-economic rights and democracy,

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