African Journal of Development Studies (AJDS)
ISSN 2634-3630 E-ISSN 2634-3649

Indexed by IBSS, EBSCO, ERIH PLUS, COPERNICUS, ProQuest, SABINET and J-Gate.

Volume 14, Number 1, March 2024
pp 233-252

A Framework for Developing mHealth Initiatives to Support Rural Caregivers of adolescents with Mental Health Issues

Doi: https://doi.org/10.31920/2634-3649/2024/v14n1a11

Ronelle Jansen
Marianne Reid
School of Nursing
University of the Free State
South Africa
jansenro@ufs.ac.za

Abstract

Rural caregivers of adolescents with mental health issues shoulder a heavy caregiving burden while facing unmet needs. Caregiver's unmet needs necessitate supporting initiatives. mHealth (mobile health) is commonly identified as an accessible means of implementing health initiatives through mobile devices such as cell phones and offers solutions with a variety of capabilities. Frameworks to inform mHealth development for caregivers in rural communities are lacking. This study aimed to develop a framework for an mHealth initiative supporting rural caregivers of adolescents with mental health issues. A multiple-method design guided the framework's development through a three-phase approach. Two separate studies were previously conducted in cumulative phases. Triangulated data from these two phases resulted in a draft framework guided by the theory-of-change logic model. Nine (n=9) expert stakeholders were purposefully invited to participate in a one-day

workshop to validate the draft framework. The expert stakeholders validated and finalised the draft framework during the workshop. The final framework visualises the six theory-of-change logic model components. The developed framework could guide the planning of mHealth initiatives supporting rural caregivers in resource-constrained communities.

Keywords: *Adolescents, Framework, mHealth initiative, Mental health issues, Rural caregivers.*

Introduction

Traditionally, caregiving is seen as a social obligation many women accept worldwide (Larkin et al., 2019). Care recipients are individuals with various acute or long-term conditions, age-related issues, physical and mental health issues, or disabilities, and include children and adolescents living at home (Bingham, 2017; Larkin et al., 2019). Typically, parents, grandparents, and family members are the primary caregivers and are instrumental in the care of adolescents (Gérain & Zech, 2019). Primary caregivers are well positioned to recognise changes in adolescents' behaviour (Talley et al., 2014) caused by challenging transitions that impact the adolescent and the family's daily functioning (Patton et al., 2016).

Caregiving practices concerning adolescents are challenged by the need to distinguish between normal developmental behaviour and the presentation of mental health issues (Patton et al., 2016; Talley et al., 2014). Caring for individuals with mental health issues presents difficulties (Chang et al., 2016), while caring for adolescents with mental health issues often makes caregivers feel incompetent regarding their caring responsibilities (Campelo et al., 2014). Caregivers are fundamental for adolescents' mental health but frequently have little understanding of adolescent behaviour, creating difficulties regarding coping and managing behaviour (Campelo et al., 2014; Talley et al., 2014).

According to Chen et al. (2019) and Talley et al. (2014), insufficient support is provided to caregivers involved in caring for individuals with mental health issues, while Hoopes et al. (2022) emphasise the importance of addressing caregivers' needs. Caregivers must look after adolescents' well-being and their own, which means they must carry a

double burden (Talley et al., 2014). Gérain and Zech (2019) confirm that caregivers can overcome the difficulties they experience if they receive adequate support.

Barriers to mental health services in rural areas shift the responsibility to the caregiver (Siceloff et al., 2017), resulting in their isolation from healthcare support (Lauckner & Hutchinson, 2016). Rural caregivers have been found to lack education regarding adolescent behaviour and mental health (Michael & Jameson, 2017); they lack exposure to health promotion strategies (Campelo et al., 2014); and they often feel unsupported (Leventhal, 2018).

Lindeman et al. (2020) believe that initiatives that address caregivers' multiple needs may improve their well-being and quality of life. Therefore, Skelton et al. (2021) believe that recognising the needs of caregivers may optimise initiatives that target their specific challenges. Effective caregiver support initiatives could also improve the care recipient's outcomes (Chen et al., 2019). Initiatives to improve the outcomes of the caregiver and the adolescent's behaviour benefit both parties. Lafferty et al. (2016) propose versatile initiatives that signify individual needs specific to each caregiver situation.

Information and communication technologies (ICTs) emerged as promising initiatives for meeting caregivers' needs. ICTs can provide support to anyone, anywhere, and anytime (Negash et al., 2018) by supplying, among others, information and connections (Newman et al., 2019), education (Källander et al., 2013), and aid in decision-making (Liverpool & Edbrooke-Childs, 2021). mHealth (mobile health) and eHealth (electronic health) are components of digital communication technologies for healthcare (digital health) (Källander et al., 2013). mHealth is widely recognised as an accessible vehicle to deliver healthcare initiatives (Källander et al., 2013; McCarthy et al., 2018) through mobile devices, such as mobile phones (Marin et al., 2017), and offers solutions through various functionalities, such as text messaging (SMS), multimedia messages (MMS), mobile applications, social media networks, and the Internet (Park et al., 2022; Anderson-Lewis et al., 2018; Botha &Booi, 2016).

mHealth technology has demonstrated effectiveness in developing countries, especially in rural areas with limited resources due to staff shortages, too few clinics, and inaccessible healthcare information (Vital Wave Consulting, 2009). mHealth technology is rapidly emerging in healthcare settings, minimises the digital divide in resource-constrained

areas (World Health Organisation, 2018), and provides cost-effective caregiver support due to its promising abilities (Anderson-Lewis et al., 2018). Appealing mHealth attributes could facilitate efficient healthcare through communication, education, support, and information (Goel et al., 2013) and preserve caregivers' well-being (Talley et al., 2014).

Unique challenges facing caregivers necessitate tailored initiatives to support caregivers in suitable ways (Tang et al., 2018), especially caregivers in rural areas (Laidlaw et al., 2017) who have specific support needs. Including caregivers intentionally in the development of initiatives may contribute to the success of initiatives (Wolff et al., 2016).

Similarly, planning and developing caregiver mHealth initiatives should engage relevant stakeholders (L'Engle et al., 2017). Stakeholders in various healthcare settings can add value to the effectiveness and usefulness of mHealth initiatives (Franz-Vasdeki et al., 2015). Partnerships between relevant stakeholders and caregivers in developing mHealth initiatives could facilitate new means of support for rural caregivers that could benefit both the creators (stakeholders) and the users (caregivers). Caregiver-focused initiatives that have been developed to transform caregiving practices (Bergström & Hanson, 2017) may improve behavioural outcomes in caregivers. Initiatives for caregivers to improve behavioural outcomes are unsuitable unless a framework guides them to define the programme activities that should be addressed by the mHealth initiative (Van Houtven et al., 2011).

Articulating a framework could be the starting point of initiatives (Funnell& Rogers, 2011) and could also ensure that feasibility is maximised. Such a framework is needed to understand the detailed components of the initiative (Wilhide et al., 2016) and determine caregiver outcomes. Daily caregiving should be strengthened by applicable initiatives that produce positive outcomes in caregiver behaviour. A clearly stated framework could foster desired results, such as behaviour change and improving caregivers' knowledge attitudes, skills, and intentions (Funnell & Rogers, 2011).

Specific determinants provide insight into how intention influences behaviour concerning key concepts in the integrated model of behaviour prediction (IMBP). The IMBP explains and predicts behaviour changes, which signify the individual's intent to perform specific behaviours, influenced by attitudes, norms, and self-efficacy (Fishbein & Yzer, 2003). Other factors that determine behaviour changes are a lack of skills and environmental constraints. Indirectly, demographics, culture, and

diversity influence individual behaviour. Individual beliefs influence behavioural determinants and, eventually, the intention to perform the behaviour (Admiraal et al., 2013). The mHealth initiative may influence caregiving practices by changing caregiver skills, knowledge, self-efficacy, and attitudes towards adolescents with mental health issues. As a theoretical model, the IMBP offers an understanding of the factors that affect behaviour change, which a theory-of-change framework could expose.

Developing a framework to identify the components of the proposed initiative may contribute to behaviour change (Mayne, 2015, 2017). The researchers determined a need for a framework proposing supportive mHealth initiatives to change caregivers' behaviour. The researchers drew on empirical evidence informing framework development to create a suitable framework.

Theoretical Underpinning of the Framework

To develop the draft framework, the researchers drew on the theory-of-change logic model method (Mertens & Wilson, 2019). A theory-of-change logic model consists of a series of components that conceptualise framework development, implementation, and evaluation by explaining practically how, why, and to what extent change can happen (Mertens & Wilson, 2019). A logic model displays a programme's theory of change by conceptualising programme planning through a graphic description of activities (Mertens & Wilson, 2019; W.K. Kellogg Foundation, 2004) by illustrating the interactions, causal links, and pathway connections (Mayne, 2017) towards the proposed framework. Constructing a theory-of-change logic model occurs through a consultative process with relevant stakeholders (Mayne, 2017; W.K. Kellogg Foundation, 2004), who map out the series of framework components (Mertens& Wilson, 2019) to deliver a product (Mayne, 2017). Presenting a draft framework in an interactive workshop will yield discussion and verify the meaning, credibility, and ownership of the initiative the framework addressed (Knowlton & Phillips, 2013). A workshop involving various stakeholders allows sharing of information and knowledge, brainstorming, and discussion so that participants reach a consensus about developing a contextual framework (Mayne, 2017). The theory-of-change logic model is supported by the triangulation of evidence from various research

designs (W.K. Kellogg Foundation, 2004) used to develop the framework.

Theory-of-change Logic model components

A theory-of-change logic model comprises six components that are visually presented in a framework. The components include underlying assumptions, the problem statement, community needs, desired results or vision for the future, influential factors, and evidence-based strategies used in similar communities (Mayne, 2017; Mertens & Wilson, 2019). *Underlying assumptions* convey whether a programme will likely work (Mertens & Wilson, 2019) in a theory-of-change framework. The *problem* or issue the framework intends to solve should be clearly defined (W.K. Kellogg Foundation, 2004; Mayne, 2015, 2017). *Community needs* relate to what needs experienced by the community led to the framework development elicited by the problem (Mertens & Wilson, 2019; W.K. Kellogg Foundation, 2004). Community, in this framework, refers to caregivers of adolescents with mental health issues. *Desired results,* including outputs, outcomes, and impact, should be clearly stated when a theory-of-change framework is structured (Knowlton & Phillips, 2013; W.K. Kellogg Foundation, 2004). Changes in the target population's behaviour, skills, knowledge, attitudes, and self-efficacy are some outcomes intended by the framework (Mertens& Wilson, 2019). These intended results offer a vision of the framework's future or changes expected in the community (W.K. Kellogg Foundation, 2004). *Influential factors* refer to factors that can either facilitate or obstruct change in the community by implementing the programme (Mertens & Wilson, 2019; W.K. Kellogg Foundation, 2004). *Evidence-based strategies* portray the actions needed to accomplish the desired results (Mertens& Wilson, 2019; W.K. Kellogg Foundation, 2004). See **Figure 1** for an example of the theory-of-change logic model components. This study aimed to develop a framework for an mHealth initiative to support rural caregivers of adolescents with mental health issues.

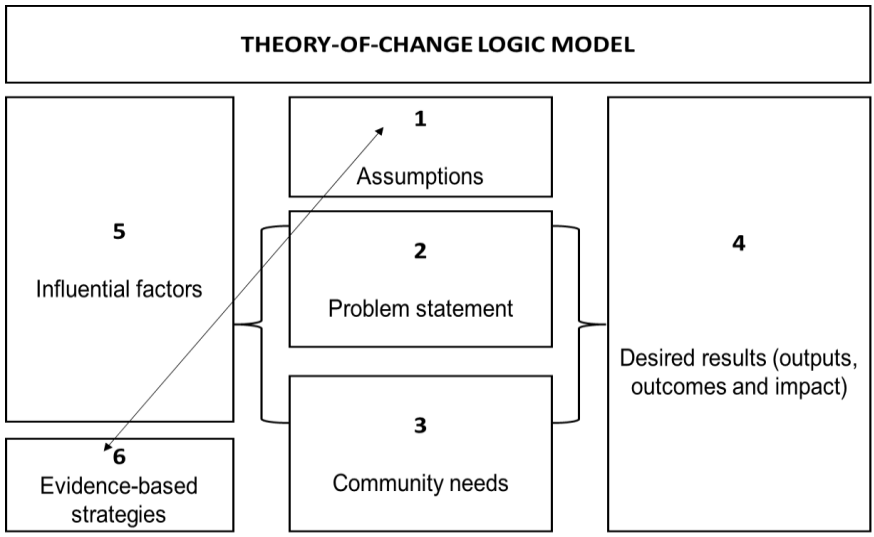

Figure 1: Theory-of-Change Logic Model Components

Methods

Research process

The framework was developed through a multiple-method research design using a three-phased approach. Two separate studies were conducted before developing the framework: a visual-based narrative inquiry (phase 1) (Jansen & Reid, 2020a) that was conducted in the Xhariep district of the Free State province and a systematic review (phase 2) (Jansen & Reid, 2020b). These two independent articles have been previously published and formed part of a PhD thesis (Jansen, 2020). This phased approach ensured a cumulative and iterative process for triangulating empirical data rural caregivers provided (Phase 1), a systematic review (Phase 2), and data based on the knowledge of expert stakeholders during a validation workshop (Phase 3).

Stakeholders that were experts in family and adolescent mental healthcare and could influence mental health policy development were invited to participate in the one-day workshop to validate the draft framework (current study). Nine stakeholders (n=9) agreed to participate in the workshop that was facilitated by an expert researcher. Stakeholders included a nursing researcher, occupational therapist, physiotherapist, social worker, religious youth minister, psychiatrist, network

administrator, community-based coordinator, and a provincial mental healthcare manager. All these stakeholders provided written, informed consent.

The researchers developed a draft framework based on the results of the two previous studies (phases 1 and 2) and a literature review. The draft framework was structured according to the theory-of-change logic model. Stakeholders were given a presentation of the previous research and the application of the Theory-of-change Logic model contributing to the development of the draft framework. A forward and backward mapping process was used to clarify or discuss the components in the draft framework. After that, stakeholder input was integrated into the draft framework, and the final framework was validated during the workshop (Phase 3).

Results

A framework developed for the mHealth initiative to support caregivers of adolescents with mental health issues was accepted after consultation and validation with expert stakeholders. A total of three components (underlying assumptions, the problem statement, and influential factors) were approved by the expert stakeholders while they contributed to three components (demonstrated by ▪ in Figure 2), namely: community needs (caregivers), desired results, and evidence-based strategies. To enhance the community needs component, the experts added the adjective "continuous" to caregivers' informational, educational, and training support. In addition, the expert stakeholders added coping strategies by introducing self-awareness and self-education as part of caring for caregivers. As a recommendation to the desired results component, the stakeholders added five points: to establish mentor and peer support programmes, to strengthen primary mental health care, to integrate mHealth with current mental health services, and to add or link to existing mHealth projects. Lastly, the experts added only mobile applications to the evidence-based strategy component. The framework illustrates the theoretically produced components of the phased approach. **Figure 2** presents the final framework.

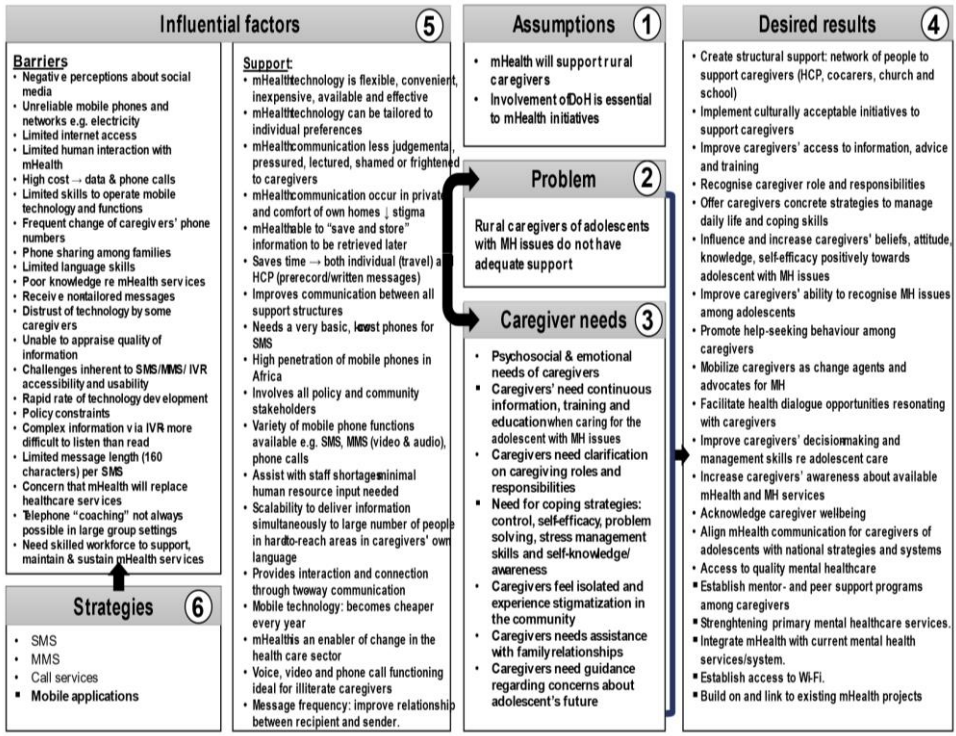

Figure 2: An mHealth communication framework for rural caregivers of adolescents with mental health issues

Discussion

A key outcome of this study was the development of a framework supporting rural caregivers of adolescents with mental health issues proposing mHealth initiatives. Talley et al. (2014) confirm the urgency of developing initiatives to support families and children with mental health issues in resource-constrained communities, which should address their unmet needs. Caregivers experience many challenges when caring for adolescents with mental health issues requiring support (Leventhal, 2018; National Academies of Sciences, Engineering, and Medicine, 2019), suggesting that proposed initiatives should focus on individual preferences and needs (Wolff et al., 2016).

Support is essential for caregivers with high demands, caregivers of recipients with challenging conditions and limited resources (Friedman et al., 2018), and caregivers of adolescents with mental health issues (Hoopes et al., 2022). Lauckner and Hutchinson (2016) list further challenges in rural communities: social isolation, poor communication and information,

and a lack of social support. Such challenges force caregivers to join informal support structures that may be unable to give adequate support or seek help from "untrained" traditional and religious healers (Talley et al., 2014); hence, the need to collaborate with healthcare professionals to offer adequate support to caregivers.

Emerging mHealth initiatives show promising results in supporting rural caregivers (Anderson-Lewis et al., 2018). As a result, it is imperative to understand caregivers' perspectives on mHealth as part of planning such initiatives. Caregivers might benefit from tailored mHealth initiatives targeting their unique support needs. Combining tailored and targeted mHealth interventions yielded positive results (Lindeman et al., 2020; Tang et al., 2018), highlighting that "one size does not fit all".

The exponential evolution of mobile phones in low and middle-income countries has harnessed promising solutions for healthcare delivery (Källander et al., 2013; Marin et al., 2017), information delivery (Marin et al., 2017), health prevention and support (Malvey & Slovensky, 2014), behaviour change communication (Lindeman et al., 2020), health education (Free et al., 2013), and training (Lindeman et al., 2020) to the end user. A framework may be helpful to visualise the systematic approach to supporting caregiving behaviour and practices via mHealth initiatives.

As part of the framework-developing process, assumptions are made about what needs to be in place for the mHealth initiative to happen, along with contextual factors that may influence it. Planned actions should assume that they will result in the desired results (Knowlton & Phillips, 2013), underpinning expectations regarding how the programme will work in a specific environment (Mertens & Wilson, 2019). Understanding context is crucial in identifying the challenges and assumptions that affect implementation and, ultimately, the success or failure of a programme. Researchers assumed that the mHealth initiative would support rural caregivers of adolescents with mental health issues.

The gap between the problem (caregivers' unmet support needs) and the planned framework can be bridged by clarifying the caregivers' context. As explained in the framework, exploring the problem creates the partnerships necessary to bring about change. Research findings derived from multiple methods confirm the relevance of the problem statement the researchers indicated (Jansen & Reid, 2020a, 2020b). Producing empirical evidence is fundamental for analysing and identifying the problem of a framework that needs to be solved (Ghate, 2018; Mertens & Wilson, 2019). A better understanding of the caregivers' context (Jansen & Reid, 2020a) allowed the researcher to develop a framework to answer the problem statement.

Findings from the three phases outlined caregivers' (the community's) needs. Research on rural caregivers of adolescents with mental health issues has been limited to date, requiring individual attention and recognition. Caregiver needs cannot be separated from resource-constrained environments. Moreover, rural caregivers would benefit from a programme addressing unmet support needs. Providing more sustainable support rather than a solitary exercise to address caregivers' needs seems reasonable. Doubt et al. (2018) report that families value dependable, continuous support. Initiatives to meet caregivers' needs may enhance their well-being, life quality, and coping skills (Skelton et al., 2021).

Initially, if the programme is going to be implemented, it is vital to understand the community's needs and align them with the desired results. The desired results entail the vision that developers have in mind for the community as the beneficiaries of the initiative. Expected behaviour or practice changes by the beneficiaries should arise because of the initiative implementation (Ghate, 2018; W.K. Kellogg Foundation, 2004). The framework visualises a roadmap to achieve the planned mHealth initiatives. The outcomes depicted in the framework envisioned that caregivers' behaviour would change if the programme were successful.

Influential factors should be considered when articulating desired results. It is possible that these factors could impact the success of a programme. The researchers found that caregivers are interested in an mHealth initiative (Jansen & Reid, 2020a, 2020b); however, influencing factors can interfere with the success of such initiatives in a resource-constrained environment. The framework outlines all possible influences that could act either as barriers or facilitators. Based on the findings, rural caregivers may be effectively supported if facilitating factors are promoted and barriers are minimised. The perception of the usability, benefits, and barriers of mHealth initiatives will determine whether users will adopt them (Feroz et al., 2018). There is anecdotal evidence in developing countries that mHealth has several benefits (Lee et al., 2018; Jusoh, 2017). Benefits include caregiver education (Anderson-Lewis et al., 2018), health support (Jusoh, 2017), capacity building among caregivers (Feroz et al., 2018), and convenience (Malvey & Slovensky, 2014). Some barriers include, e.g., costs and inadequate funding (Jusoh, 2017), cultural challenges (Townsend, 2015), poor digital literacy (Jusoh, 2017), and limited access to resources (Kampmeijer et al., 2016). The link between influential factors (barriers and support) and proposed strategies is acknowledged in the framework.

All findings indicated that several evidence-based strategies involving communication technology could support rural caregivers. The study reviewed mHealth strategies that have proven effective for caregivers in resource-constrained settings. In the framework, these strategies are outlined as the best approach to achieving the desired results. The authors discovered evidence-based strategies identified from literature that had studied populations like the current research.

Supporting caregivers globally through mHealth initiatives has proven practical and promising (Anderson-Lewis et al., 2018; Davies & Lund, 2017). Surprisingly, developing countries are ahead of developed countries regarding mobile penetration. Mobile technology ownership and subscriptions may offer solutions to the burdened healthcare system in the current healthcare climate. Wireless communication technologies can reduce health disparities and provide affordable healthcare services (Anderson-Lewis et al., 2018; Istepanian & Woodward, 2017). Health care services may be available to anyone, anywhere, at any time, thanks to the convenience of mobile phones.

Mobile phones offer a variety of functions and delivery modes, including short message services (SMS), multimedia services (MMS), and mobile applications. Mobile applications can disseminate content (Osei et al., 2021) and provide support (Liverpool &Edbrooke-Childs, 2021; Källander et al., 2013). SMS and calendar applications are embedded in basic mobile phones, while WhatsApp demonstrates a more complex application that runs on smartphones (Marin et al., 2017). The possibilities of mobile applications in rural healthcare are prodigious (Laidlaw et al., 2017) and exhibit improved healthcare delivery through various mobile channels (Free et al., 2013). If people have mobile phones at their disposal, rural populations have opportunities to access support.

One of the challenges experienced in South Africa regarding mHealth projects is a lack of practical approaches, frameworks, and interoperability (Department of Health, 2019). Initiatives offering support have the potential to relieve caregivers' burdens and improve their well-being (Sala-González et al., 2021; Talley et al., 2014). There is tremendous potential for mobile apps in rural healthcare, as they provide support, advice, information, training, reminders, interaction, health monitoring, and encouragement (Laidlaw et al., 2017; World Health Organisation, 2016, 2018).

In conclusion, the proposed mHealth strategies will likely support rural caregivers in achieving the desired results associated with improved caregiving practices. The theory-of-change logic model was an essential building block for drafting the framework suggesting mHealth initiatives

based on evidence that could support rural caregivers. A framework could optimise the effectiveness of caregiver programmes, enhancing both caregivers' and care recipients' outcomes (Van Houtven et al., 2011). Positive outcomes are related to the initiative's impact on caregivers' behaviour. A change in caregivers' behaviour, for example, knowledge, skills, and attitude, could result from the initiative's effectiveness (Mertens & Wilson, 2019).

Strengths and limitations

Specific strengths of the study are worth noting. A combination of empirical evidence, the theoretical foundation of framework planning, active engagement, and consensus among expert stakeholders ensured the study's methodological rigour. Consensus by multiple stakeholders during the validation workshop ensured plausible confirmation of research procedures; –stakeholders agreed on the conclusions drawn by the researchers. The authors acknowledge that not all stakeholders knew the study's methodology. However, interactive discussions limited the possible interpretation errors of the framework. Since the framework focused on a specific rural area in South Africa, generalisability is limited.

Conclusion

Transparency in the development process constitutes a believable approach to how the framework could support rural caregivers through an mHealth initiative. One should understand how the framework activities are expected to achieve the desired results for rural caregivers of adolescents with mental health issues. A successful framework is determined by the intended results secured by the chosen strategies (Knowlton & Phillips, 2013; W.K. Kellogg Foundation, 2004). *"Knowing where you are headed is critical to picking the best route to use"* (Knowlton & Phillips, 2013). This quote explains the vision of the researchers for the current framework. Nurses must respect caregivers' role in managing ongoing care to transform caregiving. Without cooperation and partnerships between academic institutions, medical professionals, and government officials, this vision cannot be realised. We also should not overlook the assistance that corporate companies, religious organisations, and nonprofit organisations may provide to carers in rural areas.

Acknowledgements:

This study formed part of a doctoral thesis published according to the institution's requirements for awarding the qualification. This study was made possible by funding from the Free State Department of Health (DOH 81/16/17) and financial support from the University of the Free State, Bloemfontein, South Africa. The authors would like to thank all the stakeholders from Phase 3 who agreed to participate in the research. The authors declare that they have no competing interests.

References

Admiraal, W., Lockhorst, D., Smit, B. &Weijers, S. (2013). The integrative model of behaviour prediction to explain technology use in post-graduate teacher education programs in the Netherlands. *International Journal of Higher Education*, *2*(4), 172–178. https://doi.org/10.5430/ijhe.v2n4p172

Anderson-Lewis, C., Darville, G., Mercado, R. E., Howell, S. & Di Maggio, S. (2018). mHealth technology use and implications in historically underserved and minority populations in the United States: Systematic literature review. *JMIR mHealth and UHealth*, *6*(6), e128. https://doi.org/10.2196/mhealth.8383

Bergström, A. L. & Hanson, E. (2017).An integrative review of information and communication technology-based support interventions for carers of home-dwelling older people.*Technology and Disability*, *29*(1–2), 1–14. https://doi.org/10.3233/TAD-160158

Bingham, J.R.K. (2017). *Experiences of caregivers of children with disabilities in semi-rural areas near Cape Town, South Africa.* (Thesis - Master). Stellenbosch: Stellenbosch University.

Botha, A. &Booi, V. (2016). mHealth implementation in South Africa. IEEE.http://hdl.handle.net/10204/9365

Campelo, L. L., Costa, S. M. &Colvero, L.deA. (2014). Difficulties of families in caring for children and adolescents with mental disorders: an integrative review. *Revista da Escola de Enfermagem da U S P*, 48 Spec No, 192–198.https://doi.org/10.1590/S0080-623420140000600027

Chang, S., Zhang, Y., Jeyagurunathan, A., Lau, Y. W., Sagayadevan, V., Chong, S. A. &Subramaniam, M. (2016). Providing care to relatives with mental illness: Reactions and distress among primary informal caregivers. *BMC Psychiatry*, *16*(1), 80. https://doi.org/10.1186/s12888-016-0786-9

Chen, L., Zhao, Y., Tang, J., Jin, G., Liu, Y., Zhao, X., Chen, C. & Lu, X. (2019). The burden, support and needs of primary family caregivers of people experiencing schizophrenia in Beijing communities: A qualitative study. *BMC Psychiatry*, *19*(1), 1–10. https://doi.org/10.1186/s12888-019-2052-4

Davies, T., & Lund, C. (2017). Integrating mental health care into primary care systems in low- and middle-income countries: lessons from PRIME and AFFIRM. *Global Mental Health,4*, e7. https://doi.org/10.1017/gmh.2017.3

Department of Health. (2019). *mHealth Strategy: 2015 - 2019. South Africa.* https://www.hst.org.za/publications/GCCStars/Resources/mhealth%20strategy%20web_1%20(1).pdf

Doubt, J., Loening-Voysey, H., Blanc, D., Cluver, L. D., Byrne, J. & Petersen, T. (2018).Delivering a parenting programme in rural South Africa: The local child and youth care worker experience.Innocenti Working Paper WP2018-01.UNICEF. https://www.unicef-irc.org/publications/939-delivering-a-parenting-programme-in-rural-south-africa-the-local-child-and-youth.html

Feroz, A., Kadir, M.M. &Saleem, S. (2018). Health systems readiness for adopting mHealth interventions for addressing non-communicable diseases in low- and middle-income countries: a current debate. *Global Health Action*, 11(1), 1496887. https://doi.org/10.1080/16549716.2018.1496887

Fishbein, M. &Yzer, M. C. (2003).Using theory to design effective health behavior interventions.*Communication Theory*, *13*(2), 164–183. https://doi.org/10.1111/j.1468-2885.2003.tb00287.x

Franz-Vasdeki, J., Pratt, B. A., Newsome, M. &Germann, S. (2015). Taking mHealth solutions to scale: Enabling environments and successful implementation. *Journal of Mobile Technology in Medicine*, *4*(1), 35–38. https://doi.org/10.7309/jmtm.4.1.8

Free, C., Phillips, G., Watson, L., Galli, L., Felix, L., Edwards, P., Patel, V. & Haines, A. (2013). The effectiveness of mobile-health technologies to improve health care service delivery processes: a systematic review and meta-analysis. *PLoS Medicine*, *10*(1). https://doi.org/10.1371/journal.pmed.1001363

Friedman, E. M., Trail, T. E., Vaughan, C. A. &Tanielian, T. (2018). Online peer support groups for family caregivers: Are they reaching the caregivers with the greatest needs? *Journal of the American Medical Informatics Association*, *25*(9), 1130–1136. https://doi.org/10.1093/jamia/ocy086

Funnell, S. C. & Rogers, P. J. (2011).Purposeful program theory.Effective use of theories of change and logic models.San Francisco, Jossey-Bass.

Gérain, P., &Zech, E. (2019).Informal caregiver burnout?Development of a theoretical framework to understand the impact of caregiving.*Frontiers in Psychology*, *10*, 1478. https://doi.org/10.3389/fpsyg.2019.01748

Ghate, D. (2018). Developing theories of change for social programmes: co-producing evidence-supported quality improvement. *Palgrave Communications*, *4*(1). https://doi.org/10.1057/s41599-018-0139-z

Goel, S., Bhatnagar, N., Sharma, D. & Singh, A. (2013).Bridging the human resource gap in primary health care delivery systems of developing countries with mHealth : narrative literature review.*JMIR mHealth and UHealth*, *1*(2), e25.https://doi.org/10.2196/mhealth. 2688

Hoopes, A.J., Brandzel, S.D., Luce, C., Ferguson, D.M., Shulman, L., Chavez, B., Lozano, P. &Lapham, G.T.(2022).What do adolescents and their parents need from mental health integration in primary care? A qualitative exploration of design insights.*J Pediatr Health Care*, 36(6), 570-581. doi: 10.1016/j.pedhc.2022.06.006.

Istepanian, R.S.H. & Woodward, B. (2017).m-Health. Fundamentals and applications.New Jersey, John Wiley & Sons.

Jansen, R. & Reid, M. (2020a). Interest in communication technology by rural caregivers of adolescents with mental health issues in South Africa: The Mmogo-method®. *Issues in Mental Health Nursing, 42(1), 24-37*. https://doi.org/10.1080/01612840.2020.1774017

Jansen, R. & Reid, M. (2020b). Caregivers of adolescents with mental health issues using communication technology: a systematic review. *JMIR MHealth and UHealth*, 8(8), e13179.https://doi.org/10.2196/13179

Jansen, R. (2020). *An mHealth communication framework for caregivers of adolescents with mental health issues.* (Thesis – PhD).Bloemfontein: University of the Free State.

Jusoh, S. (2017).A survey on trend, opportunities and challenges of mHealth apps.*International Journal of Interactive Mobile Technologies*, *11*(6): 73–85.

Källander, K., Tibenderana, J. K., Akpogheneta, O. J., Strachan, D. L., Hill, Z., Ten Asbroek, A., Conteh, L., Kirkwood, B. R., & Meek, S. R. (2013). Mobile health (mhealth) approaches and lessons for increased performance and retention of community health workers in low and middle-income countries: a review. *Journal of Medical Internet Research*, *15*(1), 1–13. https://doi.org/10.2196/jmir.2130

Kampmeijer, R., Pavlova, M., Tambor, M. & Groot, W. (2016). The use of e-health and m-health tools in health promotion and primary

prevention among older adults: a systematic literature review. *BMC Health Services Research*, 16(5), 467–479.

Knowlton, L. W. & Phillips, C. C. (2013).T*he logic model guidebook: Better strategies for great results* (2nded). Thousand Oaks, SAGE.

L'Engle, K., Plourde, K. F., &Zan, T. (2017).Evidence-based adaptation and scale-up of a mobile phone health information service. *MHealth*, 3(11), 1-9. https://doi.org/10.21037/mhealth. 2017.02.06

Lafferty, A., O'Sullivan, P., O'Mahoney, P., Taggart, L.&Bavel, B. Van.(2016). *Family carers' experiences of caring for a person with intellectual disability,* Final report.October. Dublin: University College Dublin.

Laidlaw, R., Dixon, D., Morse, T., Beattie, T. K., Kumwenda, S. &Mpemberera, G. (2017). Using participatory methods to design an mHealth intervention for a low-income country, a case study in Chikwawa, Malawi. *BMC Medical Informatics and Decision Making*, *17*(1), 1–12. https://doi.org/10.1186/s12911-017-0485-6

Larkin, M., Henwood, M. & Milne, A. (2019). Carer-related research and knowledge: Findings from a scoping review. *Health and Social Care in the Community*, *27*(1), 55–67. https://doi.org/10.1111/hsc.12586

Lauckner, H. M. & Hutchinson, S. L. (2016). Peer support for people with chronic conditions in rural areas: A scoping review. *Rural and Remote Health*, *16*(1), 3601.

Lee, E., Clarkson-Hendrix, M. & Lee, Y. (2016).Parenting stress of grandparents and other kin as informal kinship caregivers: A mixed methods study.*Children and Youth Services Review*, 69: 29–38. http://dx.doi.org/10.1016/j.childyouth.2016.07.013.

Leventhal, T. (2018).Neighborhood context and children's development: when do neighborhoods matter most? *Child Development Perspectives*, *12*(4), 258–263. https://doi.org/10.1111/cdep.12296

Lindeman, D., Kim, K., Gladstone, C.&Apesoa-Varano, E. (2020). Technology and Caregiving: Emerging Interventions and Directions for Research. *The Gerontologist*, 60.S41-S49. 10.1093/geront/gnz178.

Liverpool S.&Edbrooke-Childs J.A. (2021). Caregiver Digital Intervention to Support Shared Decision Making in Child and Adolescent Mental Health Services: Development Process and Stakeholder Involvement Analysis JMIR Form Res, 5(6): e24896doi:10.2196/24896

Malvey, D. M. &Slovensky, D. J. (2014).*mHealth - Transforming healthcare*. New York, Springer.

Marin, H., Massad, E., Gutierrez, M., Rodrigues, R. &Sigulem, D. (2017).Global health informatics.*Studies in Health Technology and Informatics,57*. https://doi.org/10.3233/978-1-60750-901-1-3

Mayne, J. (2015). Useful theory-of-change models.*Canadian Journal of Program Evaluation*, *30*(2), 119–142. https://doi.org/10.3138/cjpe.230

Mayne, J. (2017). Theory of change analysis: Building robust theories of change. *Canadian Journal of Program Evaluation*, 32(2), 155–173.

McCarthy, O. L., Wazwaz, O., Osorio Calderon, V., Jado, I., Saibov, S., Stavridis, A., López Gallardo, J., Tokhirov, R., Adada, S., Huaynoca, S., Makleff, S., Vandewiele, M., Standaert, S.& Free, C. (2018). Development of an intervention delivered by mobile phone aimed at decreasing unintended pregnancy among young people in three lower middle income countries. *BMC Public Health*, *18*(1), 1–15. https://doi.org/10.1186/s12889-018-5477-7

Mertens, D. M. & Wilson, a. T. (2019).*Program evaluation theory and practice. A comprehensive guide* (2nded). New York, The Guilford Press.

Michael, K. D. & Jameson, J. P. (2017).Handbook of rural school mental health. In K. D. Michael & J. P. Jameson (Eds.), *Handbook of rural school mental health*. Springer.https://doi.org/10.1007/978-3-319-64735-7

National Academies of Sciences, Engineering. (2019). Achieving behavioral health equity for children, families, and communities. Workshop proceedings. Washington, DC: National Academies Press. https://doi.org/10.17226/25347

Negash, S., Musa, P., Vogel, D. &Sahay, S. (2018). Healthcare information technology for development: improvements in people's lives through innovations in the uses of technologies. *Information Technology for Development*, *24*(2), 189–197. https://doi.org/10.1080 /02681102.2018.1422477

Newman, K., Wang, A. H., Wang, A. Z. Y. & Hanna, D. (2019). The role of internet-based digital tools in reducing social isolation and addressing support needs among informal caregivers: A scoping review. *BMC Public Health*, *19*(1), 1–12. https://doi.org/10.1186/s12889-019-7837-3

Osei, E. &Mashamba-Thompson, T. P. (2021). Mobile health applications for disease screening and treatment support in low-and middle-income countries: A narrative review. Heliyon, 7(3), e06639. https://doi.org/10.1016/j.heliyon.2021.e06639

Park, J., Tracy, C. S. &Gray, C. S. (2022). Mobile phone apps for family caregivers: A scoping review and qualitative content analysis. *Digital health*, 8, 20552076221076672.https://doi.org/10.1177/2055207622107 6672

Sala-González, M., Pérez-Jover, V.,Guilabert, M.&Mira,J.J. (2021).Mobile Apps for Helping InformalCaregivers: A Systematic Review. *Int. J. Environ. Res. Public Health*, 18,1702.https://doi.org/10.3390/ijerph1804

1702

Siceloff, E., Barnes-Young, C., Massey, C., Yell, M. &Weist, M. (2017).Building policy support for school mental health in rural areas. In K. D. Michael & J. P. Jameson (Eds.), *Handbook of rural school mental health*. Boone, Springer.

Skelton, B., Knafl, K., Van Riper, M., Fleming, L. & Swallow V. (2021).Care Coordination Needs of Families of Children with Down Syndrome: A Scoping Review to Inform Development of mHealth Applications for Families. Children, 8(7):558. https://doi.org/10.3390/children8070558

Talley, R.C., Fricchione, G. L. &Druss, B. G. (2014).*The challenges of mental health caregiving.Research • Practice • Policy*.New York, Springer.

Tang, C., Chen, Y., Cheng, K., Ngo, V. &Mattison, J. E. (2018). Awareness and handoffs in home care: coordination among informal caregivers. *Behaviour and Information Technology*, *37*(1), 66–86.https://doi.org/10.1080/0144929X.2017.1405073

Townsend, B. (2015). Mobile for development mHealth. mHealth regulation impact assessment: Africa. 3 March 2015. GSMA.

Van Houtven, C. H., Voils, C. I. & Weinberger, M. (2011). An organising framework for informal caregiver interventions: Detailing caregiving activities and caregiver and care recipient outcomes to optimise evaluation efforts. *BMC Geriatrics*, *11*(77), 1–18. https://doi.org/10.1186/1471-2318-11-77

Vital Wave Consulting. (2009). *mHealth for development: The opportunity of mobile technology for healthcare in the developing world. Washington, D.C. and Berkshire, UK: UN Foundation-Vodafone FoundationPartnership.*

W.K. Kellogg Foundation. (2004). *W.K. Kellogg Foundation logic model development guide*. W.K. Kellogg Foundation.

WilhideIII. C. C., Peeples, M. M. & Anthony Kouyaté, R. C. (2016). Evidence-based mHealth chronic disease mobile app intervention design: development of a framework. *JMIR Research Protocols*, *5*(1), 1–13. https://doi.org/10.2196/resprot.4838

Wolff, J. L., Darer, J. D. & Larsen, K. L. (2016).Family caregivers and consumer health information technology.*Journal of General Internal Medicine*, *31*(1), 117–121. https://doi.org/10.1007/s11606-015-3494-0

World Health Organization (2016).*Monitoring and evaluating digital health interventions: A practical guide to conducting research and assessment.*World Health Organization. https://doi.org/CC BY-NC-SA 3.0 IGO

World Health Organization. (2018). *Digital technologies: shaping the future of primary health care.* World Health Organization.

http://www.who.int/docs/default-source/primary-health-care-conference/digital-technologies.pdf?sfvrsn=3efc47e0_2