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Reciprocal innovation in implementation science and global health: reflections from the EXTRA-CVD (extending the HIV treatment cascade for cardiovascular disease prevention) study

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Abstract

Reciprocal innovation, a model of sustained, multidirectional exchange in which health strategies are adapted, revisited, and refined across contexts, offers a compelling framework to rethink how implementation science can support global health equity by enabling dynamic, multidirectional learning across different contexts. Drawing on the EXTRA-CVD trial, a nurse-led cardiovascular disease prevention intervention designed to extend the HIV treatment cascade in United States (U.S.) HIV clinics, which adapted strategies informed by implementation research in Kenya and the U.S. Veterans Affairs health system, this perspective examines how reciprocal innovation can begin to emerge within existing research structures, as well as where opportunities for deeper exchange remain limited. We identify four operational domains of reciprocal innovation: care delivery strategies, end-user engagement, research methodologies, and research leadership and partnership. Across these domains, we describe how cross-context learning shaped intervention adaptation and site-level implementation in EXTRA-CVD, as well as missed opportunities where more intentional feedback, shared leadership, and methodological exchange could have strengthened multidirectional learning. Taken together, this work highlights both the potential and the practical challenges of reciprocal innovation in implementation research, emphasizing its role in moving beyond unidirectional knowledge transfer toward iterative, context-responsive learning. By embedding structures for iterative feedback, equity-centered governance, and multidirectional learning systems within research and implementation systems, future global partnerships can foster more inclusive, responsive, and sustainable health interventions.

Keywords Reciprocal innovation, Implementation science, Non-communicable disease, Human-centered design, Health equity

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Background

Despite decades of attention to improving global health systems, persistent barriers to high-quality, equitable care remain across both low- and middle-income countries (LMICs) and high-income countries (HICs) [1, 2]. While health systems in these settings may differ in structure and resources, they often face similar implementation challenges, including fragmented health systems, healthcare access disparities, socioeconomic constraints, and difficulty sustaining interventions at scale [3]. Historically, innovation in global health has largely flowed in a single direction: from resource-rich institutions to low-resource systems [4, 5]. This paradigm reflects entrenched hierarchies in knowledge production and dissemination and has been increasingly challenged by calls for decolonization, more equitable partnerships, and locally led innovation. Critics argue that dominant models of innovation undervalue knowledge generated in resource-constrained settings and risk reinforcing power imbalances rather than addressing them.

In response, global health policy and practice have increasingly emphasized equity, partnership, and contextual responsiveness, including shifts toward shared governance, local leadership, and bidirectional learning. In parallel, the relatively young field of implementation science has grown alongside global health by offering systematic approaches to applying and adapting evidence-based strategies in real-world settings [6]. Yet despite these shared commitments, both fields often continue to rely on linear models of innovation and adaptation that assume a fixed origin of knowledge and limit opportunities for sustained learning across contexts [7, 8]. In an era of shared global health challenges, from non-communicable diseases to pandemic preparedness, there is a growing imperative to move beyond adaptation toward models of exchange that are more iterative, equity-centered, and contextually grounded.

What is reciprocal innovation?

Reciprocal innovation has emerged as a concept that reimagines how health systems learn from one another [9]. Rather than assuming that innovations originate in a single setting and move in a fixed direction, reciprocal innovation is a dynamic, multidirectional process in which strategies are shared, adapted, and refined across diverse contexts over time [10–12]. In this model, learning continues as innovations are implemented, reflected upon, and revisited in new settings.

This framing builds on earlier approaches to innovation in global health. Technology transfer has traditionally assumed a linear flow of ideas from one setting to another. Reverse innovation challenged this paradigm by highlighting the value of innovations developed in low-resource settings and their application in HIC contexts [13]. Approaches such as co-production and co-design have also emerged to describe collaborative innovation through end-user engagement within a given setting [14]. In practice, these concepts are not mutually exclusive, and their methods often overlap. For example, co-production may be used during adaptation processes, and reverse innovation may generate benefits that extend back to the original setting [15].

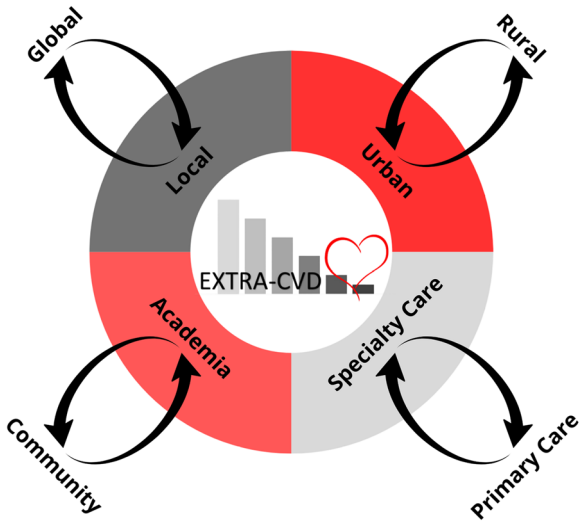

Fig. 1 Conceptual illustration of reciprocal innovation in the EXTRA-CVD trial. This figure depicts reciprocal innovation as multidirectional learning across health system contexts, including global and local settings, rural and urban environments, community and academic spaces, and primary and specialty care. Rather than a linear "back-and-forth" transfer between countries or systems, reciprocal innovation is illustrated as an iterative, multilateral process shaped through exchanges across these settings. In the context of EXTRA-CVD, these flows reflect how prior experiences and cross-context insights informed intervention design and adaptation

Reciprocal innovation builds on this landscape by emphasizing intentional, sustained, and multidirectional exchange, in which innovations move across health system contexts and are refined and reintegrated through ongoing cycles of mutual learning [9]. Although developed in the context of global-to-local innovation, we and others use the term to describe idea flows between innovators and adopters across other boundaries as well, such as rural to urban settings, primary to specialty care, and community to academia (Fig. 1) [16]. This concept aligns with several foundational theories. Diffusion of Innovations Theory suggests that knowledge transfer is most effective when innovations are adapted to meet the needs of new adopters [17]. Social Learning Theory highlights the importance of iterative cycles of observation, adaptation, and feedback [18]. Together, these perspectives

frame reciprocal innovation as a process of iterative co-evolution, in which ideas are continually shaped by those who implement them.

For example, a nurse-led chronic care model developed in rural Kenya may inform similar approaches in urban clinics in the U.S. As the model is adapted to meet the needs of different health systems, perhaps through new team structures or decision support tools, additional strategies are likely to emerge. In many cases, the process stops after adaptation. Reciprocal innovation, however, emphasizes that these adaptations can feed back into the original Kenyan model, enhancing both iterations through continued engagement, shared reflection, and refinement over time. In this way, both settings evolve their approaches rather than remaining fixed at a single moment of innovation.

Challenges in applying reciprocal innovation

While reciprocal innovation holds strong conceptual appeal, its practical application can be challenging due to entrenched power asymmetries in global health and implementation research. Structural inequities often reinforce one-way flows of knowledge even in well-intentioned partnerships. For example, grant funding structures disproportionately favor urban, academic HIC institutions, while limited institutional support, meager coverage of institutional overhead costs, insufficient mentorship, and lack of capacity-strengthening opportunities constrain the ability of LMIC researchers to lead and sustain research careers [19–22]. Health systems also differ in financing, regulatory environments, data infrastructure, and capacity to test or adapt new models. Power dynamics within research partnerships can further restrict LMIC or community collaborators from meaningfully shaping research agendas and decisions. These inequities are often compounded by authorship and recognition disparities, where LMIC and community collaborators are under-credited for their intellectual and programmatic contributions [23]. Together, these barriers can undermine the goal of equitable, multidirectional exchange and make reciprocal innovation difficult to realize.

Taken together, these challenges and the progression of global health and implementation science suggest that reciprocal innovation may emerge unevenly within existing research structures. Power asymmetries, funding mechanisms, and institutional norms shape where and how reciprocal learning occurs, often concentrating exchange at particular stages of research or among specific actors (e.g., co-investigators). As reciprocal innovation has emerged alongside growing attention to equity and partnership in research, critical examination of whether and how collaborations embody reciprocal innovation is essential for understanding both its promise and the conditions required to support more sustained, multidirectional exchange.

Learning across contexts: the EXTRA-CVD experience

This perspective uses the EXTRA-CVD (A Nurse-Led Intervention to Extend the HIV Treatment Cascade for Cardiovascular Disease Prevention) trial as a case example of how reciprocal innovation can begin to emerge within existing research structures, as well as where opportunities for deeper multidirectional exchange remain limited [24]. The EXTRA-CVD trial tested a nurse-led cardiovascular disease prevention intervention for people with HIV in the U.S [24]. While conducted in a HIC context, the study was shaped by knowledge, strategies, and design approaches drawn from two key sources: the Academic Model Providing Access to Healthcare (AMPATH) Kenya Chronic Disease Management (CDM) program and prior U.S. Veterans Affairs (VA) implementation research. Key contributions from each are summarized in Table 1.

AMPATH Kenya is an academic global health partnership between Moi University College of Health Sciences, Moi Teaching and Referral Hospital, and a consortium of North American universities coordinated through Indiana University [40, 41]. The origins, governance, and organizational structure of the AMPATH partnership have been previously described in detail [42]. The AMPATH Kenya CDM program was created in response to Kenya's rising chronic disease burden [43] and has developed and tested strategies for decentralizing care through nurse-led models and mobile health tools [25, 26, 35, 44–48]. Two AMPATH Kenya studies were particularly influential in shaping EXTRA-CVD's design. The Bridging Income Generation with Group Integrated Care (BIGPIC) study was among the first LMIC studies to use HCD to adapt a care delivery model integrating microfinance and group care to address both clinical and socioeconomic needs [33, 35, 49]. The Strengthening Referral Networks for Management of Hypertension Across the Health System (STRENGTHS) study extended HCD methods to evaluate strategies for strengthening referral networks for hypertension management across multiple levels of the Kenyan health system [34]. Together, these studies demonstrated how design approaches could be integrated with implementation research to support adaptation and learning across care delivery systems.

EXTRA-CVD also drew from a series of U.S.-based studies conducted within the VA and affiliated primary care clinics. Across these studies, researchers explored how nurse-led care, telehealth, and behavioral support

Table 1 Domains of Reciprocal Innovation in the EXTRA-CVD Trial

Domain	Contributions from AMPATH Kenya and U.S. VA studies	Adaptation within EXTRA-CVD	Opportunities for strengthening reciprocity
Care delivery strategies	Kenya: Developed and evaluated a nurse-led hypertension model with task-shifting strategies [25, 26]. Developed electronic health record and digital tools to track chronic disease management [27, 28]. US: Pioneered nurse-led home blood pressure monitoring and tailored behavioral and digital interventions in primary care settings [29–31]. Assessed integration of technology into clinical workflows [32].	Adapted a nurse-led approach for cardiovascular disease prevention in HIV care, integrating task-shifting and telehealth strategies across multiple study sites Applied iterative adaptations based on local workflows and provider roles	Foster feedback loops where adaptations made in the U.S. can inform the refinement of the original innovations developed in Kenya Explore how digital telemonitoring tools adapted for U.S. HIV care might inform future iterations of Kenya's chronic disease platforms Use shared digital platforms or collaborative learning labs to co-develop digital health models and evaluate scalability across settings
End user engagement	Kenya: Applied human-centered design (HCD) to adapt and refine chronic disease care models, engaging patients and providers in design iterations [33, 34].	Incorporated HCD strategies to tailor intervention components for diverse patient populations Adapted HCD to complex U.S. clinical systems with electronic health record and regulatory constraints, illustrating how design methods must evolve in highly regulated environments	Feedback regulatory, technological, or cultural adaptations to HCD strategies to inform subsequent co-design to Kenyan teams Create formal leadership roles for LMIC investigators in future design and implementation studies
Research methodologies	Kenya: Applied social network analysis to evaluate referral networks for hypertension care [35, 36]. Conducted process evaluations to assess fidelity, engagement, and barriers to sustainability	Adapted social network analysis to assess patient-provider communication patterns and care team dynamics Incorporated real-time process evaluation to assess implementation fidelity, site-level adaptations, and contextual barriers	Adapt EXTRA-CVD's social network analysis approach to explore trust and collaboration within Kenyan chronic disease care teams Share EXTRA-CVD process evaluation learnings to refine real-time monitoring frameworks in Kenyan chronic disease programs
Research leadership and partnership	Kenya: Contributed to evolving global norms on authorship equity and shared governance through partnerships that fostered research infrastructural and mutual leadership (AMPATH) [37–40].	Initial dissemination led primarily by U.S.-based researchers, integrating lessons from global collaborations to inform design and analysis	Institutionalize shared authorship norms; fund cross-context leadership roles Create structured roles for Kenyan co-investigators to lead dissemination and cross-site publications

This table summarizes how cross-context learning shaped the design and implementation of EXTRA-CVD across four domains: (1) care delivery strategies, (2) end user engagement, (3) research methodologies, and (4) research leadership and partnership. For each domain, the table identifies prior contributions from AMPATH Kenya and/or the U.S. VA health system, describes how these informed adaptation and implementation within EXTRA-CVD, and outlines opportunities to strengthen reciprocal exchange beyond the study period. The table distinguishes realized adaptations from areas where multidirectional learning could be further extended

could be integrated into routine chronic disease management. For example, the Take Control of Your Blood Pressure (TCYB) trial evaluated nurse-led home blood pressure monitoring combined with a behavioral telephone intervention [29]. The Hypertension Intervention Nurse Telemedicine Study (HINTS) and the Veterans Study to Improve The Control of Hypertension (V-STITCH) assessed nurse-led telemedicine approaches for behavioral and medication management [30, 31]. The Simultaneous Risk Factor Control Using Telehealth to Slow Progression of Diabetic Kidney Disease (STOP-DKD) trial piloted a pharmacist-list telehealth model for patients with chronic kidney disease [32].

Together, these Kenyan and U.S.-based studies formed a shared foundation that shaped the design and implementation of EXTRA-CVD, illustrating how reciprocal innovation can begin to emerge through the integration of prior experiences, diverse methods, and research partnerships across contexts. Through iterative discussion and reflection among co-investigators involved in these studies, we identified four key domains where reciprocal exchange began to emerge (Fig. 2). In the spirit of continued, mutual learning, we also note areas where multidirectional exchange remained incomplete, highlighting opportunities for deeper, iterative learning and lessons for future partnerships.

Domain 1: care delivery strategies

Reciprocal innovation can drive meaningful improvements in care delivery by enabling cross-contextual learning between health systems with distinct but overlapping challenges. Rather than simply transplanting innovations, reciprocal innovation can facilitate an iterative process whereby local realities (e.g., healthcare infrastructure, provider roles, and regulatory environments) can shape how care delivery strategies are implemented and refined.

Task-sharing and nurse-led care delivery A key example from EXTRA-CVD was the adaptation of nurse-led cardiovascular disease prevention strategies. In the AMPATH Kenya CDM program, nurses used treatment algorithms to guide hypertension management, including medication titration, follow-up, and referral [48]. Clinical outcomes were comparable to those of mid-level providers (clinical officers), but retention in care remained low at 12 months due to systemic barriers such as medication cost, supply chain disruptions, transportation challenges, medical system mistrust, and socioeconomic stressors [25, 50]. These findings demonstrated both the potential of nurse-led chronic disease care as a scalable solution in systems severely strained by a limited workforce and also the need for task-sharing strategies to be accompanied by broader system-level adaptations.

Additional lessons emerged from U.S. studies demonstrating the effectiveness of nurse-led telephone interventions, home blood pressure monitoring, and collaborative behavioral counseling in primary care and VA settings [29, 30]. These interventions were particularly effective among patients with poor baseline blood pressure control [30], but successful implementation depended on the alignment of these strategies with team structures, clinical workflows, and information systems, including documentation and referral processes [51]. Together, these findings highlighted the importance of embedding nurse-led care within existing systems to ensure operational feasibility and sustainability.

In EXTRA-CVD, insights from both settings were adapted to the unique context of U.S. HIV clinics, where cardiovascular disease prevention is often fragmented across primary and specialty care. Nurses served as care coordinators, bridging communication between HIV providers, primary care clinicians, and specialists. In addition, elements of the nurse-led model, including structured support for home blood pressure monitoring, have been incorporated into routine practice in some participating clinics. Additionally, adapted versions of the intervention are being implemented in other HIV care settings, reflecting ongoing application of these strategies across contexts. Co-authors and investigators are in discussion with policymakers, decision-makers, and program implementers about system-level changes that can arise from these learnings. Together, these experiences suggest that care delivery innovations shaped through cross-context learning can continue to shape models of practice as they are taken up, adapted, and extended across new clinical settings.

Leveraging digital innovation for chronic disease care Digital innovation was a second area in which elements of reciprocal innovation were evident in care delivery. AMPATH developed one of the earliest large-scale electronic health record (EHR) systems in Africa (AMPATH Medical Record System, AMRS) [27], which evolved to support point-of-care data entry, clinical decision support, data visualization, and electronic referrals [28]. The STRENGTHS study in Kenya integrated AMRS with a peer navigator program to address barriers to hypertension referral completion. A key lesson learned was the importance of aligning technological innovations with broader health system priorities and reforms [34]. Other studies have similarly emphasized that digital solutions for chronic disease care must be designed with local infrastructure and context in mind to support scalability and sustainability [52].

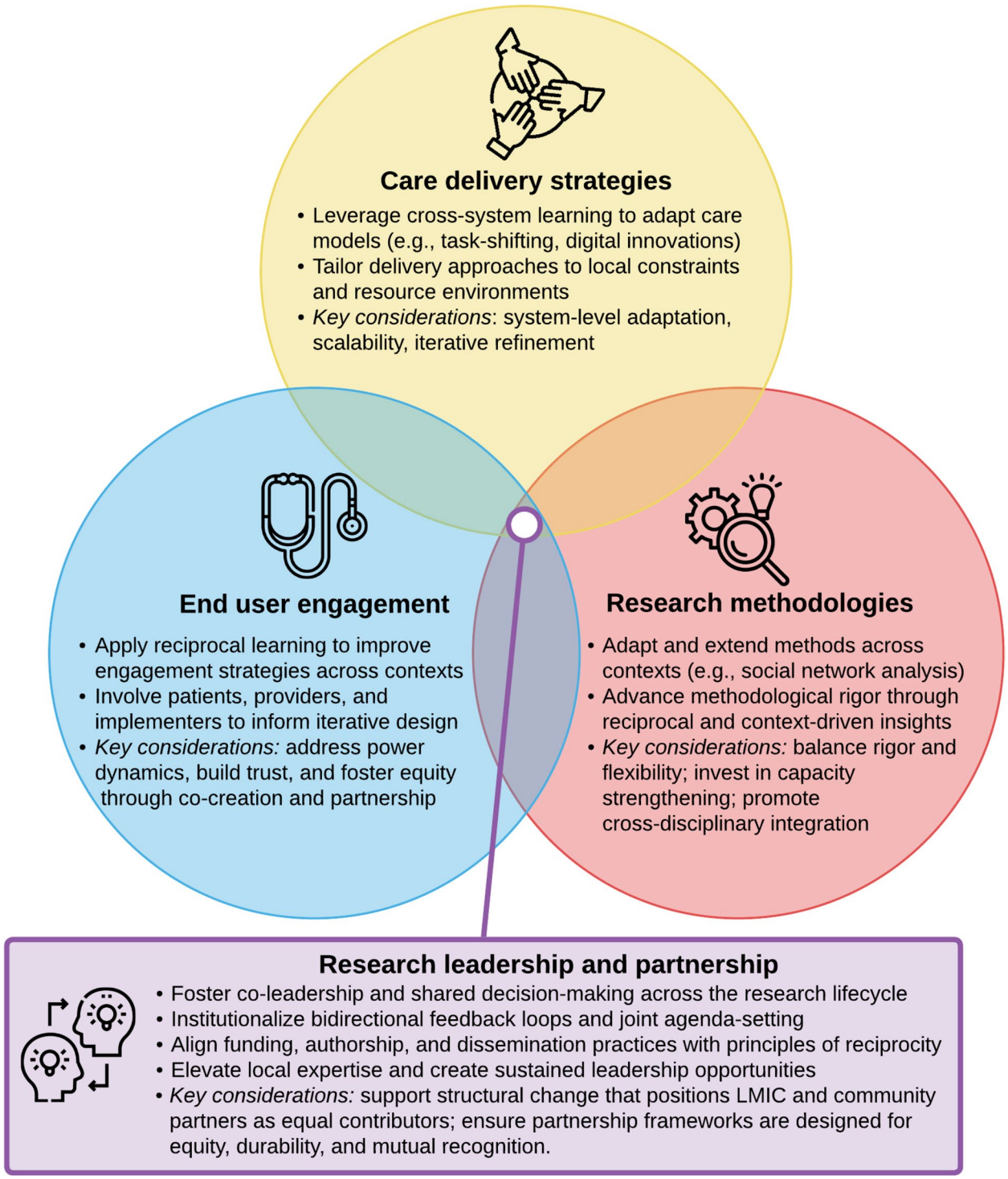

Fig. 2 Key domains of reciprocal innovation. This figure illustrates four domains through which reciprocal innovation can be examined within implementation research: care delivery strategies, end-user engagement, research methodologies, and research leadership and partnership. Each domain highlights mechanisms through which cross-context learning may occur, as well as key considerations that shape how reciprocal exchange unfolds across contexts and stages of research. The central axis reflects the role of research leadership and partnership in facilitating, constraining, and sustaining multidirectional learning. Together, the domains emphasize that reciprocal innovation depends on intentional design across multiple levels of the research lifecycle

In parallel, U.S. studies piloted wireless home blood pressure monitoring and telehealth-based counseling [30], demonstrating how digital tools can augment team-based care beyond the clinic. EXTRA-CVD drew on these lessons to integrate patient monitoring across multiple EHR platforms, developing site-specific workflows and avoiding siloed technology solutions. The onset of the COVID-19 pandemic accelerated digital adaptations, such as videoconferencing with nurses for observed home blood pressure measurements. Nurses also served as technology coaches to support patients in adapting to virtual care. These adaptations demonstrated both the flexibility of digital tools and the importance of embedding them in existing context and systems.

Domain 2: end user engagement

Reciprocal innovation creates opportunities to share and adapt strategies for engaging end-users to enhance contextual fit, increase implementation feasibility, and support equitable care delivery [53–57]. HCD and other co-creation approaches have been used in global resource-limited settings to tailor interventions by involving end-users in co-developing solutions that reflect their needs [53–57]. These methods are also increasingly applied in implementation research to improve relevance and contextual fit [58–61].

In Kenya, the BIGPIC study used HCD to engage community members, microfinance experts, and healthcare workers in co-designing a chronic disease care model that integrated group care with financial empowerment [62]. The STRENGTHS study in Kenya built on this approach to develop a multicomponent implementation strategy to improve hypertension referral completion [34, 45]. Both studies emphasized early and frequent end-user engagement to support contextual understanding and alignment with health system and community priorities. Iterative design phases surfaced key implementation barriers and informed key intervention decisions. STRENGTHS also highlighted a key challenge in applying HCD within implementation research: balancing the iterative, user-driven nature of design with predefined research scopes and timelines. Navigating differing perspectives among study investigators, design teams, and end users was a central lesson learned.

EXTRA-CVD drew on these lessons to apply HCD in the local contexts of Cleveland, Ohio, and Durham, North Carolina. Nurses, patients, and clinic staff contributed to intervention development, shaping components such as motivational interviewing, behavioral coaching, EHR tools, and clinic workflows. Several nurses with prior experiences in the VA-based studies brought both clinical and research perspectives to bear in advocating for pragmatic implementation adaptations.

HCD improved the feasibility, acceptability, and contextual fit of the intervention [63]. However, its application within highly regulated U.S. research and clinical environments introduced new constraints to iterative design. Institutional review processes, EHR documentation requirements, and standardized workflows limited which intervention components could be co-developed or modified, requiring creative workarounds to uphold user-centered principles. Together, these experiences highlight that end-user engagement strategies are shaped not only by participant needs, but also by the regulatory and organizational environments in which implementation occurs.

Domain 3: research methodologies

Reciprocal innovation can enhance the application and interpretation of research methodologies by enabling cross-context learning across diverse health systems. In Kenya, social network analysis and process evaluation tools were adapted from organizational and social sciences to evaluate how social and system dynamics shape chronic disease care. Insights from these studies helped shape the application of these methods in the EXTRA-CVD study.

The Kenya-based BIGPIC study used social network analysis to explore how participants' social relationships influenced cardiovascular risk [36]. While overall risk scores were not associated with specific network attributes, greater social cohesion was linked to modifiable risk factors such as diet and physical activity. The STRENGTHS study in Kenya extended this approach to the health system level, applying social network analysis to reveal key gaps in referral networks that informed the study's implementation strategies [64]. These foundational insights shaped the application of social network analysis in EXTRA-CVD to evaluate how trust and communication evolved within HIV care teams [65]. The study mapped egocentric (individual-level) connections among patients, providers, and nurses to examine how the nurse-led intervention influenced relational dynamics within the care team over time.

In addition, both BIGPIC and STRENGTHS embedded structured process evaluations using the Saunders Framework [66]. Process evaluations assess how implementation unfolds in real-world contexts by examining intervention fidelity, reach, and contextual influences [67, 68]. In BIGPIC, the process evaluation revealed several key influences on implementation, including ongoing participation in the intervention (dose received) and the impact of financial barriers on participation (e.g., medication costs, opportunity costs

associated with missed work). These findings emphasized the importance of monitoring engagement over time and identifying implementation bottlenecks early. Drawing on these insights, EXTRA-CVD included both formative and summative components in the process evaluation. Formative evaluation included a quarterly cross-site "boot camp" for nurses to support shared reflection and collaborative problem-solving, and summative evaluation included objective assessments of nurse performance to assess fidelity and support real-time adaptation. Fidelity tools adapted from prior Kenya studies were implemented using tablet-based REDCap (Research Electronic Data Capture), a secure web-based data capture platform, in EXTRA-CVD, reflecting adaptation to local infrastructure and clinical workflows. This evolving application of process evaluation illustrates how methodological learning can move across settings and strengthen the rigor and responsiveness of interventions across diverse settings.

Domain 4: research leadership and partnership

To fully harness the potential of reciprocal innovation, research leadership and partnership structures play a critical role in shaping where and how reciprocal learning occurs. Leadership arrangements influence who participates in agenda setting, how these decisions are made, and which voices are included in interpretation and dissemination. These dynamics, in turn, shape the distribution and reach of reciprocal innovation.

Reflecting on the EXTRA-CVD trial, reciprocal exchange was strongest during grant development and early implementation, facilitated through the inclusion of investigators from prior Kenya and U.S. VA studies as co-investigators. Reciprocal learning occurred through shared intervention design, adaptation of implementation strategies and process evaluation measures, and continued input throughout research activities, including the involvement of a nurse interventionist from a prior VA study in the design phase. These mechanisms enabled meaningful bidirectional learning at the investigator level during key phases of the study.

However, reciprocity was less consistently extended beyond these stages and roles. We recognize missed opportunities to engage frontline implementers in cross-context learning, and to intentionally feed back study findings to our Kenyan and VA partners for shared interpretation and reflection. These patterns illustrate how reciprocal innovation can remain concentrated among investigators and particularly study phases unless leadership and partnership structures are deliberately designed to extend learning across roles, settings, and the full research lifecycle. In our ongoing individual research and broader engagement with research consortia, we continue to work toward research structures that elevate shared learning and mutual recognition, advancing reciprocal innovation as a sustainable and equitable model for global implementation science.

Advancing reciprocal innovation: lessons and future directions

Through the case example of EXTRA-CVD, we illustrate how elements of reciprocal innovation can add value by enabling multidirectional learning across contexts and stages of research. Kenyan and VA-derived strategies meaningfully shaped the U.S.-based EXTRA-CVD intervention, influencing care delivery design, end-user engagement approaches, and research methodologies. In this way, EXTRA-CVD provides an applied example of how strategies developed in distinct health systems can inform cross-context adaptation and generate lessons for future partnerships. Importantly, reciprocal innovation in this case did not begin solely with EXTRA-CVD. Elements of the BIGPIC and STRENGTHS trials in Kenya had previously incorporated lessons from U.S.-based implementation strategies and related health systems research, as described in their respective protocol publications [45–49]. Thus, this reflects the multidirectional nature of reciprocal innovation, as opposed to a direct "back-and-forth" learning cycle.

Our analysis underscores other important considerations. First, exchange was most visible during grant development and early implementation, particularly at the investigator level. In addition, systematic reintegration of adaptations emerging from EXTRA-CVD into Kenya or the VA health system has not to date consistently or purposefully occurred. The potential for such reintegration remains, but its realization requires intentional planning and infrastructure.

In reflection, many research partnerships already contain elements that resemble reciprocal innovation. Collaborative design, shared authorship, and cross-site exchange are common features of global health research. However, these structures do not automatically result in sustained, purposeful multidirectional learning. Without explicit mechanisms for reintegration across settings, exchange may remain partial or concentrated within specific phases or roles. Reciprocal innovation requires moving beyond episodic collaboration toward deliberate structures that prioritize ongoing exchange through deliberate feedback loops. Its potential lies not only in the resulting interventions, but also in the learning processes that influence how research is designed, implemented, and interpreted. Our experience suggests that this approach can surface implementation insights that are unlikely to emerge within isolated systems and can strengthen both the durability of interventions and

the equity of knowledge production across diverse health systems. Making these mechanisms explicit helps move reciprocal innovation from aspirational framing toward practical guidance for implementation research across diverse health systems.

Operationalizing reciprocal innovation therefore requires intentional design choices across the research lifecycle. As illustrated in Fig. 2, reciprocal innovation unfolds across overlapping domains and depends on structures that connect learning across roles and phases of research. Future efforts should intentionally create mechanisms that extend learning beyond investigators and early research phases. This includes structured opportunities for frontline implementers, such as nurses and intervention staff, to participate in cross-context learning, shared reflection, and co-interpretation of findings. Engagement strategies, including HCD, should be treated as evolving tools that can be iteratively refined across settings rather than fixed methods applied once. Similarly, research methods should allow adaptation to local data availability, infrastructure, and resource constraints, with transparent documentation of these adaptations [69]. Implementation frameworks such as FRAME-IS provide practical guidance for maintaining rigor while supporting shared ownership and mutual capacity building [70]. Together, these approaches can help shift reciprocal innovation from episodic collaboration toward more sustained and multidirectional exchange [71, 72].

Our experience in EXTRA-CVD also highlighted that ethical and regulatory systems are not neutral backdrops, but active components of the implementation context that shape where and how reciprocal innovation can occur. Institutional review processes, data governance requirements, and standardized clinical workflows influenced which adaptations were feasible, whose input was prioritized, and where iterative learning was possible. Advancing reciprocal innovation therefore requires attention not only to methods and engagement strategies, but also to the regulatory and organizational architectures in which research and care delivery are embedded. As health systems in Kenya and other LMICs expand digital infrastructure, governance complexity, and regulatory oversight, these considerations will become increasingly central to the design of equitable and responsive reciprocal learning processes.

Even when investigators intentionally design for reciprocal exchange, its realization is shaped by how authority, resources, and decision-making power are distributed within the broader research ecosystem. When decision-making authority and resources are concentrated within a limited set of institutions or investigators, opportunities for reciprocal learning can narrow to specific actors or stages of a project. Institutions and funders can shape these conditions by setting expectations around leadership, authorship, and capacity strengthening, and by determining whether grant mechanisms allow sufficient time and flexibility for feedback, adaptation, and reintegration across project cycles. Recent funding initiatives from the Fogarty International Center, the American Heart Association, and the Patient-Centered Outcomes Research Institute reflect growing attention to these dynamics [73–75]. Longstanding academic partnerships rooted in trust and local leadership such as AMPATH further illustrate how reciprocal innovation may be sustained over time through shared leadership and accountability between LMIC and U.S. investigators, supporting mentorship, capacity strengthening, and ongoing methodological exchange across generations of researchers. More broadly, advancing reciprocal innovation requires deliberate but feasible shifts to institutionalize equitable collaboration and embed mechanisms for mutual learning. While system-level change can be slow, our experience suggests progress can begin with intentional actions by individual researchers that shape how partnerships are initiated, governed, and how knowledge is exchanged.

Conclusions

Reciprocal innovation offers a pragmatic framework for advancing equity, contextual relevance, and scientific rigor in implementation science and global health. By reflecting on both realized and missed opportunities in EXTRA-CVD, this perspective advances practical guidance for designing research partnerships that support shared learning over time. Making these dynamics explicit is essential to moving reciprocal innovation from concept to practice in global health and implementation science.

Abbreviations

AMPATH	Academic Model Providing Access to Healthcare
BIGPIC	Bridging Income Generation with Group Integrated Care
CDM	Chronic disease management
EXTRA-CVD	A Nurse-Led Intervention to Extend the HIV Treatment Cascade for Cardiovascular Disease Prevention
HCD	Human-centered design
HIC	High-income country
HINTS	Hypertension Intervention Nurse Telemedicine Study
LMIC	Low- and middle-income country
REDCap	Research Electronic Data Capture
STRENGTHS	Strategies to Strengthen Referral Networks for Hypertension Services
TCYB	Take Control of Your Blood Pressure
USA	United States of America
VA	Veterans Affairs
V-STITCH	Veterans Study to Improve The Control of Hypertension
STOP-DKD	Strategies to Reduce Progression of Diabetic Kidney Disease

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Authors' contributions
RV conceptualized the paper. CLL led the writing of the first draft and subsequent revisions and edits. RV and CTL edited multiple drafts, contributed specific sections, and provided overall guidance. All other authors edited the text. All authors read and approved the final manuscript.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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