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A case study integrating scenario thinking with dialysis policymaking in Thailand

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Abstract

Background: Healthcare policymaking often struggles to account for complex future uncertainties, particularly for policies affecting healthcare infrastructure or stakeholder behaviour. Scenario thinking is a structured approach for exploring multiple plausible futures. It has, however, been underutilised in healthcare policymaking. We applied scenario thinking to the 2024 dialysis policy in Thailand to guide policymaking under future uncertainty.

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Methods: Our study is composed of three parts: scenario development, policy analysis, and evaluation of scenario thinking in the policy process. We developed future scenarios using the intuitive logics method, which systematically identifies and explores key uncertainties, and the critical scenario method to evaluate stakeholder responses. Policy options were evaluated for their robustness across future scenarios. We assessed the overall approach according to fitness-for-purpose, influence, and efficiency indicators from established evaluation frameworks for health technology assessment.

Results: Four scenarios are presented along the dimensions of kidney transplant accessibility and skilled workforce availability. Approval of patients prior to dialysis initiation and a quality monitoring system can strengthen the dialysis programme's adaptability to future change, while considerable uncertainty exists regarding performance of service provider payment mechanisms. Our evaluation suggests that scenario thinking is an efficient method to characterise future uncertainty within available resources for policymaking.

Conclusions: This study demonstrates how scenario thinking can systematically evaluate healthcare policies under future uncertainty, providing a framework for more robust policies. Further research is needed to facilitate its use, building on the adaptations developed in this study to bridge scenario thinking with established processes and standards for healthcare policy.

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Plain language summary

When healthcare policies are made, it is often under the assumption that present conditions will continue. This gives us a poor understanding of risk, particularly for policies that are difficult to change or that rely on people's behaviour. We tested scenario thinking, a structured method commonly used in business, to evaluate policies for kidney failure treatment in Thailand. By exploring different possible futures, we found important risks and opportunities that traditional analysis missed, particularly around how healthcare providers might respond to policy changes. While adapting this method for healthcare required some adjustments, it proved to be a practical tool that required few extra resources. Our study shows how scenario thinking could help make healthcare policies more prepared for future challenges.

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Introduction

Healthcare policies have to be made in the context of high uncertainty about the future[1,2]. Some of this uncertainty is relatively predictable: future disease patterns and life expectancy can be estimated within confidence ranges, for example[3,4]. There is, however, uncertainty that is harder to predict through conventional models[5,6], including the nature of doctor-patient relationships [7], technological advancements[8], future healthcare budget allocation[3,9], and pandemics[10,11].

Healthcare policy institutions often rely on predictive models to account for future uncertainty[1,12], but lack systematic, transparent methods to account for the broader context in which a particular health policy operates[13,14]. Although predictive models work well for evaluating specific technologies with clear timeframes and impacts[6], many healthcare policies require a broader view of uncertainty[3,15]. This is particularly true for policies with long implementation times[15,16], such as workforce and infrastructure planning[17,18]; policies outside established institutional frameworks[17], where lack of defined governance may increase future uncertainty[9,19]; and policies that aim to influence behaviour or depend on social interaction, such as health promotion interventions[3] or policies to influence supply and demand of health services. It can also be important for policies with multiple strong vested interests and hidden agendas[15,20].

Futures research takes a fundamentally different approach from standard healthcare policymaking, by constructing "images" of multiple plausible futures rather than seeking to predict a single outcome[21]. These futures are shaped by external sources of change and the potential responses of different stakeholders[6]. Within futures research, scenario thinking is a problem structuring method to systematically explore how policies might perform under different future conditions[22]. The multiple futures are not developed to show what will happen, but rather to illustrate the future uncertainty and how it may shape (and be shaped by) policy or strategic action[8]. This approach aligns with healthcare priority-setting principles of systematic, transparent, and inclusive decision-making[23,24].

Despite its widespread use in strategic business planning [25,26], scenario thinking has seen limited application in healthcare policy[14]. While it has informed healthcare workforce planning [17,18,27–30], infrastructure decision-making[31], technology evaluation[32,33], and pandemic planning[34], its adoption faces barriers. Healthcare institutions' reliance on quantitative data and low tolerance for uncertainty have limited uptake[17], with successful applications typically requiring integration with quantitative

modelling[18,27,28]. Yet few studies have examined how to adapt scenario thinking for healthcare's unique institutional and methodological requirements, or for diverse global contexts.

A broader view of the future may be especially relevant for low-income and middle-income countries (LMICs), where fragmented institutions, political turnover, evolving insurance schemes, and volatile donor funding create additional, external layers of uncertainty in policy success[35]. Scenario thinking has informed health system and palliative care planning studies in Iran[36,37], community-level integrated health in Vietnam[38], and one of South Africa's national HIV/AIDS plans[39]. However, experience of scenario thinking for healthcare policy in LMICs remains limited, with almost all studies in a handful of high-income countries[14].

In this study, we address this gap by integrating scenario thinking with Thailand's 2024 kidney replacement therapy (KRT) policy. Similar to other countries, Thailand faces a growing burden of kidney failure and increasing demand for KRT[40]. KRT is a life-sustaining but high-cost treatment for patients with kidney failure that diverts healthcare resources away from other disease areas and creates difficult trade-offs between patient needs and healthcare system capacity[41–43]. The policy context exemplified the need for broader future uncertainty analysis, as it carried long-term implications for workforce and manufacturing capacity, aimed to influence both patient and provider behaviour, and involved multiple stakeholders with competing interests outside of established governance frameworks.

Our study demonstrates how scenario thinking can strengthen healthcare policy development while addressing previous barriers to adoption in three ways. Specifically, we show how this method can be adapted to (i) integrate with existing policymaking infrastructure to evaluate policy robustness to future uncertainty, (ii) anticipate stakeholder responses in this context, and (iii) align with existing knowledge and practice of healthcare policy researchers. Practically, the findings directly informed the 2024 KRT policy in Thailand by identifying potential vulnerabilities in proposed policies and highlighting the importance of system adaptability to maintain equitable access to high quality services.

Methods

Case study: kidney replacement therapy in Thailand

The study examined the 2024 dialysis policy for Thailand's Universal Coverage Scheme (UCS), a government-funded health insurance scheme that covers around 75% of the population[44]. The rest of

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the population is covered by public health insurance schemes for government or private sector employees[45]. Although all public health insurance schemes in Thailand cover KRT[46], most patients receive dialysis, due to a shortage of centres providing kidney transplant (particularly outside of Bangkok), limited infrastructure for organ procurement, and laws around organ donation[46–48]. Dialysis is provided as peritoneal dialysis (PD), which the patient administers at home, or as haemodialysis (HD), which is provided by specialised nurses in healthcare centres. In Thailand, PD is only provided by public hospitals, whereas around 80% of HD patients registered under UCS receive services in private hospitals or private HD clinics[49].

Prior to 2022, unless contraindicated, dialysis patients registered under UCS could only access PD for free, whereas the other two insurance schemes fully reimbursed both PD and HD[50]. A 2022 policy change allowed UCS patients to choose between PD or HD[50], but concerns around financial sustainability and system capacity to provide high-quality services led to re-visiting the policy in 2024[51]. This research was conducted to inform recommendations of the National Health Security Office (NHSO) ad-hoc working group on KRT.

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Methodological approach

Our study is composed of three parts: scenario development, policy analysis, and evaluation of scenario thinking in the 2024 KRT policy process. The timeframe for the futures analysis was defined as 5-10 years, to reflect potential healthcare workforce and infrastructure consequences, whilst recognising health technology's rapid advancement. The scenarios were developed from June to September 2024, alongside other research informing the 2024 KRT policy[21]. Our research team was composed of medical professionals, political scientists, and public health researchers, most of whom participated as members of the secretariat for the NHSO ad-hoc working group (Table S1).

Scenario development

In futures research there are two broad methods for scenario development: descriptive methods that seek to provide the context for policy action and normative methods that describe the ideal future to shape policy action[21]. Since the goal of the 2024 dialysis policy was to realise immediate change, we applied descriptive methods, to understand how different policy options may perform over the next 5-10 years in different future contexts. We followed the intuitive logics method, as it is multi-dimensional

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(i.e. able to explore many types of impact that may be important to different stakeholders) and considers how stakeholders will act to preserve or enhance their own interests[25]. We included the critical scenario method as part of scenario development, as a means by which to explicitly account for stakeholder interests and mechanisms of power[8]. This was particularly important for our policy question, as exploratory research had highlighted that the motivation for the 2022 policy change and its unintended consequences were largely driven by stakeholder actions to protect their interests[50].

We followed the steps of the scenario thinking method developed by Cairns and Wright [8], with adaptations for healthcare policymaking in Thailand (Supplementary Data 1). We first determined a preliminary list of exogenous factors affecting the dialysis programme in the past, present, and future from secondary data of 20 in-depth interviews with policymakers, service providers, and medical associations as well as a focus group discussion with 12 patients (Table S2), which had been collected to understand the rationale for the 2022 policy change. We conducted secondary thematic analysis according to the PESTEL (political, economic, social, technological, ecological and legal) framework to identify exogenous factors and the causal relationships between them, from the perspective of interviewees and focus group participants[8]. A single coder first familiarised themselves with the transcripts and the PESTEL framework, before extracting quotes that either: (1) related to a preferred or possible future state of the world, or (2) described how past or current actions would affect the future. Quotes were categorised according to the PESTEL framework and represented diagrammatically to show the causal links between keywords in the quote. Diagrams with key words representing similar concepts were merged, resulting in a preliminary set of potential future states (across elements of the PESTEL framework) with a causal chain of external events that could lead to that future state.

This initial set of exogenous factors was reviewed during a half-day stakeholder workshop with 21 participants comprising dialysis nurses, nephrologists, patients, government payers, and suppliers (Table S3). Participants were selected to represent a range of perspectives of the KRT programme (for example, by including both junior and senior healthcare professionals as well as participants from different provinces). During the workshop, participants grouped related factors into clusters based on causal relationships and identified extreme outcomes from each cluster. Although it is recommended to have heterogeneous groups [22,25], we separated senior nephrologists into a separate group to account for hierarchical power structures and instead tried to improve heterogeneity by sharing ideas across teams via facilitators (Supplementary Data 1). We had included “remarkable thinkers” (individuals with knowledge that can challenge business-as-usual and perceptions around the future[52]) in two of the

groups to overcome myopic views of the future that have been well-documented in research studies[22,25] but we faced challenges in encouraging group discussion around input from the remarkable thinkers.

The research team therefore further elaborated workshop inputs before classifying each cluster according to its potential impact and level of uncertainty. We conducted a quasi-anonymous ranking Delphi survey with a panel comprising two members of the KRT secretariat, two researchers supporting the KRT policy, and one researcher from the health technology assessment agency. Following an initial 1-hour training session, panellists anonymously ranked the uncertainty and impact of each cluster with a rationale, until reaching consensus on the two clusters with highest combined impact and uncertainty. For each round, participants received a template matrix to complete via email, together with an anonymised file containing all participant responses to the previous round (example provided in Figure S1). Consensus via unanimous agreement was reached after two rounds, with two days for the first round and five days for the second round. We then placed extreme outcomes from the selected clusters in a 2x2 matrix to define four scenarios.

We used the critical scenario method to identify how different actors would perceive each future and actions they may take to protect their own interests, forming the basis of scenario narratives. Given the research team's predominant affiliation with Thai policy institutions, an external team member (AC) reviewed outputs to challenge assumptions and check narrative consistency.

Scenarios were validated by argumentation, reviewing consistency of storylines, ensuring consistency both within each scenario (internal) and with established facts (external), and seeking transparency throughout scenario development process[21]. Narratives were reviewed by the research team according to established principles[22]:

- scenarios are multi-dimensional,
- scenarios challenge implicit assumptions about what may change in future, and
- narratives are engaging and promote understanding.

Policy analysis

We analysed seven policies already proposed by the NHSO working group (Table 1), which were informed by qualitative research, literature reviews, and budget projections of the KRT programme[50]. We applied robust decision analysis, which evaluates policy options under multiple plausible futures, to identify policies that are likely to be successful despite considerable future uncertainty [6,55]. We defined

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robust as policies that performed better in futures with system strain, moderately robust as policies that performed similarly across all futures, and not robust as policies that had variable performance depending on future conditions. The critical scenario method assessed the role of different actors on policy success. We considered policies to be vulnerable to stakeholder responses if the policy could be overturned or ineffective, moderately vulnerable if the scale of impact depended heavily on stakeholder responses, and not vulnerable otherwise. Two analysts independently evaluated the policies under the base case future and the four future scenarios, for analyst triangulation.

Evaluation of the role of scenarios thinking in the policy process

We evaluated how scenario thinking informed the 2024 KRT policy using established health technology assessment (HTA) evaluation frameworks, comprising a framework to evaluate the impact of HTA systems[56] and outcome indicators for deliberation in HTA[23]. We adopted elements of the frameworks that were applicable to futures research and relevant for single studies (Table S4).

The resulting evaluation framework (Table 2) assessed fitness-for-purpose, influence, and efficiency of the futures study in the policy process. Fitness-for-purpose evaluates whether the futures study provided relevant information for decision-making that would otherwise have been missing from the policy process (1a), and whether the futures study fulfilled its purpose, in terms of increasing understanding of future uncertainty (1b) and the role of actors in impeding or enhancing whether a policy achieves the expected goals (1c). For this study, the comparator to assess whether futures analysis provided additional relevant information was other research being undertaken to inform the policy, namely two literature reviews and a system dynamics modelling study[50]. Influence considers the extent to which results from the futures study shaped the final policy that was recommended and approved (2a) and the plan for policy implementation (2b). Efficiency provides a qualitative assessment of the value for money of the study, in terms of the resources required to complete the study relative to the benefits (3a).

Ethics

The Ethics Committee of the Institute for the Development of Human Research Protections (IHRP) Thailand approved the sub-study for interview data collection on February 22nd, 2024 (COA No. IHRP2024025; IHRP No.002-2567). All participants provided consent to participate.

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Results

Scenario development

During the scoping stage, the research team identified the following themes as exogenous factors that could shape the future of the KRT programme: marketing strategies of dialysis service providers, which could affect behaviour of doctors, nurses, and patients; inequality between the benefit package of public health insurance schemes, leading to patient dissatisfaction and advocacy; dialysis reimbursement policies in neighbouring countries, affecting local manufacturing investment and supply chain; technological advancements in kidney transplant and dialysis; the success of community health promotion and prevention activities to reduce the burden of non-communicable diseases; and changes in the culture of medical professions to shift towards shared decision making with patients.

Through stakeholder workshops and analysis, these factors were consolidated into seven clusters of driving forces: (1) viability of the dialysate manufacturing plant in Thailand; (2) accessibility of kidney transplant; (3) kidney failure burden; (4) level of alignment across the three health insurance funds; (5) quality of utilities (including water and electricity supply); (6) private HD centre business viability; and (7) the size and capabilities of the dialysis workforce. The causal links between driving forces and extreme outcomes for each cluster are shown in Figure S2.

Of these clusters, two were judged to have both high impact and high uncertainty within the 5-10 year timeframe of this study: (3) the accessibility of kidney transplant and (7) the size and capabilities of the dialysis workforce. The impact of kidney transplant accessibility could vary based on new technological advances, investment in the service system, or legal changes. Workforce capacity impact would depend on government and service provider responses to workforce shortages, such as quality assurance requirements, salary increases, or training programmes. While other factors like the burden of kidney failure, viability of the dialysate manufacturing plant, and private HD centre business viability could have significant impact, the magnitude of impact considered more predictable (and therefore low uncertainty).

The two key uncertainties formed the basis for four scenarios (Figure 1), representing different combinations of kidney transplant accessibility and workforce constraints. These scenarios represent possible futures and are not intended to depict what would happen with a particular level of workforce

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availability or transplant access, nor the likely or preferable future. The full narrative for each scenario is provided in Supplementary Data 3.

Policy analysis

The policy analysis firstly considered how the future may be shaped by actor responses to each policy, before evaluating the policy performance across future scenarios (Table 3). A description of each policy and the full policy analysis is provided in Supplementary notes 1.

Our analysis highlighted that the success of three policies (restricting payments of the doctor fee, global budget, and bundle payments) depends heavily on private service provider responses. Bundle payments attempt to equalise financial incentives across all treatment options, namely HD, PD, and comprehensive conservative care (CCC, an approach for patients unsuitable for dialysis, comprising interventions to delay disease progression and minimise complications, with shared decision making and planning, alongside psychologic and family support)[57]. However, their effectiveness depends on private service providers diversifying their portfolio to include PD and CCC. Otherwise, private HD service providers are still motivated to attract more HD patients and financial incentives will likely remain. Similarly, global budget implementation may severely decrease accessibility and quality of HD services if private service providers consider the business case to be too risky. Such a policy may require strong regulatory oversight and measures to guard against geographical inequity in access to HD services, such as bus services for HD patients in rural areas. The performance of a continuous quality improvement (CQI) scheme was judged to be highly dependent on support from other government departments and medical associations. The pre-authorisation system, which requires patients to be approved by regional committees before dialysis can start, could risk being overturned if patients and doctors perceive it as a barrier to service access. Patient education could have broader benefits if used to increase awareness of available services, including transplant options and medications that should be provided for free.

We rated pre-authorisation and CQI as highly vulnerable to future stakeholder actions, as the policy could be overturned or ineffective (Table 3). Global budget, bundle payment, and patient education were rated as moderately vulnerable, since private service provider reactions could greatly impact the scale of change achieved. Restrictions in the doctor fee and implementation of a CCC protocol were rated as low vulnerability.

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In the robustness analysis, pre-authorisation, a CCC protocol, and a CQI scheme all showed similar or improved performance in the future scenarios, as they had broader systemic benefits. Pre-authorisation puts in place a system that allows prioritisation of patients according to need in the context of resource constraints or when expanding access to new services; CQI puts in place a system to uphold service quality during periods of system strain or introduction of new technologies; and the CCC protocol is likely to encourage strengthening of palliative care services, with benefits for other disease areas such as cancer. Global budget, however, could make the KRT programme vulnerable to future shocks, as the business case for private centres is already precarious and any change prompting closure of private HD centres could force a higher percentage of patients into comprehensive conservative care, particularly in rural areas.

Evaluation of scenario thinking within the KRT policy process

The evidence used for the assessment of each indicator is shown in Supplementary Data 4. In terms of fitness for purpose, we found that the futures analysis revealed insights that were not identified through other analyses conducted for the 2024 KRT policy. Results from a literature review had recommended patient education, bundle payments, and CCC protocol, on the basis that similar policies had improved uptake of PD and CCC in other countries [58,59]. Subsequent system dynamics modelling had shown that these policies do not address specific drivers in the Thai context and that the doctor fee, pre-authorisation, or global budget may be required to meet policy goals[60]. It had also highlighted the risk of reduced access to services with global budget. However, the conventional methods of literature review and modelling did not identify the importance of private service provider response on the performance of bundle payments and education, as there was no structured method to account for potential stakeholder responses in the Thai context, and did not identify the broader systemic strengths of pre-authorisation and a CQI system, as literature review outcomes were based on a single indicator (as opposed to multi-dimensional impact explored by the futures analysis) and the system dynamics model projections did not account for external change to the system.

In terms of policy influence, draft recommendations from the working group were revised following presentation of the futures analysis, placing greater emphasis on pre-authorisation and CQI, with less prominence for bundle payments and education. We had updated the system dynamics modelling to account for uncertainty highlighted by the futures analysis, and this prompted significant discussion within the working group meeting around why bundle payments did not achieve the policy goals despite

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evidence from the literature review. The findings from our analysis related to the importance of securing support from different stakeholder groups for the implementation of pre-authorisation and CQI were not explicitly discussed in the NHSO Board meeting. However, since the Board established a permanent working group to oversee policy implementation, our study is unlikely to have accurately measured this indicator.

From the perspective of efficiency, resource requirements for the scenario thinking exercise were modest. We estimate that staff time required to complete the study was less than 10% of that ordinarily spent developing an economic evaluation to inform policy, which is likely justified for policies that would benefit from a broader view of future uncertainty.

Discussion

This study illustrated the potential benefits of scenario thinking to account for future uncertainty in healthcare policy. Our analysis for the 2024 KRT policy in Thailand highlighted social dimensions of uncertainty that are typically absent from decision analysis in healthcare and identified the broader health system impact of policies. This provided an expanded view of decision risk by bridging between decision analysis and implementation planning, which are traditionally separate functions in the governance of healthcare systems.

Consistent with the literature, we faced challenges in applying scenario thinking for healthcare policy[13,17]. Since most members of the research team and working group come from clinical or economics backgrounds, there was tendency to judge the likelihood of each scenario or to provide a strict definition of impact. There was also scepticism around the role of narratives and stakeholder analysis, which were not perceived to be rigorous methods compared with systematic reviews or economic evaluation studies. Similar cultural barriers have been found in other scientific disciplines[20,61–63] and studies from South Africa and Iran have similarly highlighted policymaker preference for quantitative data in scenario planning[36,39]. We additionally found that cultural dynamics of policy processes influenced whether points made in group discussion were elaborated further by the group or ignored, making it difficult to achieve productive discussion among a heterogeneous group with out-of-the-box thinkers, as recommended by the future scenarios literature[22,25]. Although quality of scenario studies depends on challenging the status quo[14], long timeframes with continued engagement are

needed to encourage participants to question assumptions about the future[3], which may not be possible in policy environments[17].

Based on our findings, we propose three key adaptations to better integrate scenario thinking with existing healthcare policy processes. Firstly, although the results of any policy analysis will ultimately be discussed and used in hierarchical policy processes, we propose that the core analytical steps be conducted within a group without a rigid hierarchical structure, utilising common methods in healthcare policy analysis such as literature review and key informant interviews to identify important external factors, as opposed to workshops. This is particularly important in setting with prominent hierarchical structures, such as LMICs government agencies. Since policy stakeholders may be involved to a lesser extent in the scenario development process, transparent reporting is encouraged to maintain trust.

Secondly, scenario thinking outputs should be presented in formats familiar to healthcare policymakers, to allow them to better understand implications of the research[64]. Although the scenario analysis literature emphasises the importance of rich scenarios for storytelling, this is not consistent with views around rigorous science in healthcare policy[65]. We found greater success linking scenario insights to quantitative modelling results, using the scenario insights to highlight which outcomes may be affected by uncertainty in future conditions or stakeholder actions. This is consistent with other scenario studies used to inform health policy from Australia, Belgium, the Netherlands, and the UK, which conducted scenario analysis alongside quantitative modelling[18,27,28,32]. It does, however, place greater importance on the role of the research team in effectively synthesising key policy implications from the futures analysis, as quantitative analysis is unlikely to capture the rich multi-dimensional insights gained from scenario thinking.

Thirdly, we recommend facilitating use of the method by developing tools to support researchers informing healthcare policy. Within healthcare, adherence to checklists and guidelines is commonly upheld as a standard of quality. Although qualitative researchers caution against the use of checklists on the basis that they may constrain insights[66–68], we recommend the development of a set of guiding principles at the global level to lay out what constitutes a high-quality scenario thinking study in healthcare. For the reasons provided above, these standards should emphasise policy implications rather than scenario storylines. At the country-level, use of scenario thinking may be better accepted and utilised if incorporated within existing national guidelines, following good practice to develop guidelines for evidence-informed decision-making[69].

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This study has a number of limitations. Firstly, stakeholder engagement challenges may have limited our view of future uncertainty, and it could be questioned whether our research team was able to accurately anticipate the future actions of actors given our institutional view of the health system and policymaking. Since the purpose of scenario analysis is not to predict what would happen, but rather to question assumptions around future uncertainty, the main risk of this limitation is that we may have a constrained view of the level of future uncertainty associated with each policy option. However, we believe that this is still more informative than conducting no analysis at all. Perhaps the most important limitation of the study is that our proposed adaptations to the methods and evaluation of the policy process are derived from a single case study. Further research is needed, particularly in LMICs, to understand which adaptations are broadly applicable to healthcare policymaking versus context-specific. With respect to our evaluation framework, the timeline of this study was too short to capture the role (if any) of this study on policy implementation. Finally, we were unable to differentiate whether the benefit of scenario thinking was specific to scenario thinking as an approach, or whether other structured methods to investigate future uncertainty would have provided similar or greater insight. Methods for futures research have been categorised across three dimensions: quantitative to qualitative, participatory to expert-based, and imagination to evidence-based[70]. Understanding which futures research methods may be most appropriate for different types of health policy questions, and adaptations required for the healthcare field for each method, is an area for further research.

Our study was conducted in a setting with established governance structures for healthcare decisions and therefore may not be representative of settings with ad-hoc decision-making. We cannot, for example, determine the extent to which influence of this study on policy was due to trust in the research team that has been built up over more than 15 years in Thailand. Furthermore, some members of the research team are part of the implementation process. We argue that this is a strength of our study, as policy research is inherently embedded within policy structures, but it may limit generalisability of findings.

In conclusion, our study found considerable benefit in expanding the view of future uncertainty for the 2024 KRT policy in Thailand. We proposed adaptations to the scenario thinking method to better align with power structures in government institutions and to present results in a way that is perceived as credible and relevant to healthcare policy institutions. The proposed adaptations aim to make scenario thinking more accessible and relevant for healthcare institutions while maintaining its core benefits. We recommend that further research: (1) articulate which healthcare policy questions would benefit from

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an expanded view of future uncertainty and support healthcare policy researchers to navigate between available futures study methods; (2) develop a set of principles and quality standards for the application of scenario thinking for healthcare policy; and (3) conduct evaluation of scenario thinking methods across a broader set of contexts to identify adaptations that are general to healthcare policy and those that may depend on the local setting.

Data availability

Any data that is not provided in the supplementary materials is available on request from the corresponding author, except interview data, which cannot be shared in adherence with ethical clearance for this study.

Figures

Figure 1. Overview of the four high impact high uncertainty scenarios, which were developed around different levels of equitable access to kidney transplant and workforce constraints.

HD – haemodialysis; KRT – kidney replacement therapy; NHSO – National Health Security Office

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Tables

Table 1. Policies evaluated in this study.

#	Policy	Description
1	Doctor fee restrictions	Regulations restricting financial payments to nephrologists from private dialysis providers, so that payment is only allowed for dialysis sessions attended by the nephrologist.
2	Pre-authorisation	Approval from a provincial committee is required prior to dialysis initiation. The committee reviews patient profile to ensure that timing and type of treatment are appropriate for the patient. In the context of HD supply constraints, the committee will prioritise patients for HD based on need.
3	Patient education	Prior to kidney failure, patients are educated by a multi-disciplinary team of healthcare professionals on available treatment options.
4	CCC protocols	Protocols and prompting questions are provided to nephrologists for assessment of patients prior to dialysis initiation. The protocols aim to identify patients who would have best quality of life with comprehensive conservative care (CCC).
5	CQI system	A continuous quality improvement (CQI) system to monitor quality of dialysis services, overseen by a working group to identify and resolve issues with dialysis service quality.
6	Global budget	The total available budget for payment of dialysis service providers is capped each year, meaning that an increased number of dialysis patients leads to decreased service fee per patient.
7	Bundle payments	Service provider payments for HD, PD, and CCC are provided as a payment per dialysis patient, adjusted for the patient case mix.

CCC – comprehensive conservative care, CQI – continuous quality improvement, HD – haemodialysis, PD – peritoneal dialysis

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Table 2. Framework to evaluate the role of scenario thinking in the 2024 KRT policy.

#	Goal	Indicator	Data source(s)
1	Fitness for purpose	a) The level of additional information/insight from the futures study, beyond other research conducted for the policy.	Comparison with the results from other research studies for the 2024 KRT policy (literature review and system dynamics modelling)[50]
		b) The research team had an expanded view of future uncertainty.	Materials from research team meetings and correspondence
		c) The research team had a greater understanding of the interests of different actors and how their responses may shape the future.	
2	Influence	a) The futures study influenced policy.	Minutes from the NHSO working group and NHSO Board
		b) The futures study influenced planning for implementation (for example, stakeholder engagement and risk mitigation plans).	Minutes from the NHSO Board
3	Efficiency	a) The human and financial resources to conduct the futures study were justified given the additional insight.	Timesheets; reflection from team members

KRT – kidney replacement therapy; NHSO – National Health Security Office

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Table 3. Summary of the policy analysis of policies proposed by the NHSO working group.

Policy option	**Vulnerability** to actor response	**Robustness** (performance relative to base case)			
		Scenario 1	Scenario 2	Scenario 3	Scenario 4
1) Doctor fee	Low	=	=	=	+
2) Pre-authorisation	Very high	+	+	=	+
3) Education	Medium	=	=	+	-
4) CCC protocol	Very low	=	+	=	+
5) CQI	High	+	+	+	+
6) Global budget	Medium	-	-	=	=
7) Bundle payment	Medium	=	=	=	=

Vulnerability: level of uncertainty in policy performance due to potential responses from different stakeholders to protect their interests. **Robustness**: change in the performance of a policy option in different scenarios, relative to the base case future.

+ indicates better performance than the base case future; **=** indicates similar performance to the base case; **-** indicates worse performance than the base case.

CCC – comprehensive conservative care, CQI – continuous quality improvement, NHSO – National Health Security Office.

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Author contributions

SB conceptualised the study. SB, NY, JQ and AC developed the research methods. SB, NY, YT, JS, KKC, and TC collected the data and conducted analysis. AC validated the analysis. SB wrote the original draft with critical review by NY, YT, KKC, JQ, and IM. JS and KKC administered the project. YT, JQ, IM, and AC provided supervision. All authors reviewed and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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Editorial summary:

First author et al. apply scenario thinking to characterise uncertainty around the future impact of different dialysis policies in Thailand. Our findings highlight the benefit of scenario thinking for systematically evaluating policy robustness and understanding how the motivations of different actors may affect policy success.

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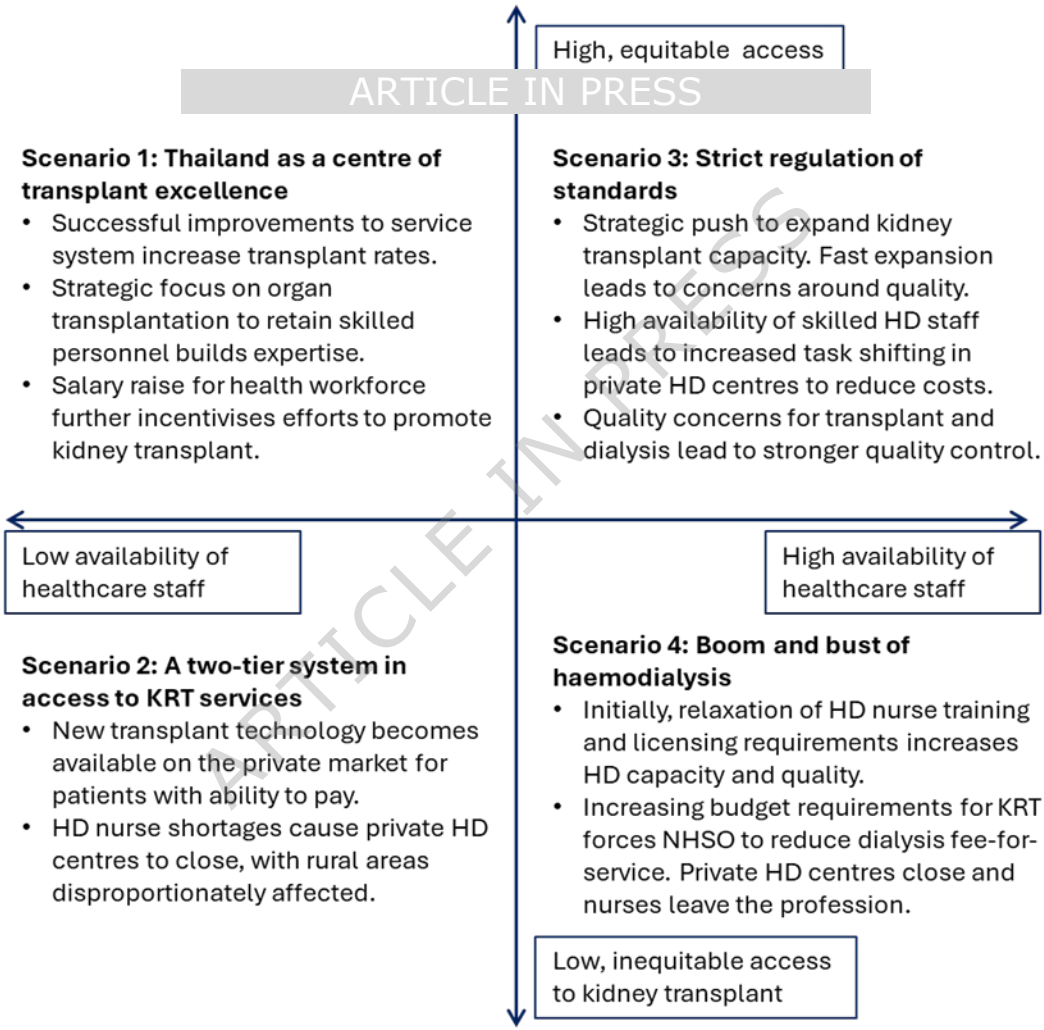

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