

When ‘solutions of yesterday become problems of today’: crisis-ridden decision making in a complex adaptive system (CAS)—the Additional Duty Hours Allowance in Ghana

Irene Akua Agyepong,^{1,2*} Augustina Kodua,³ Sam Adjei⁴ and Taghreed Adam⁵

¹Ghana Health Service, Greater Accra Regional Health Directorate, Accra, Ghana, ²University of Ghana School of Public Health, Legon, Ghana, ³Ministry of Health, Accra, Ghana, ⁴Center for Health and Social Services (CHESS), Accra, Ghana and ⁵Alliance for Health Policy and Systems Research, World Health Organization, Geneva, Switzerland

*Corresponding author. Ghana Health Service, Greater Accra Regional Health Directorate, P.O. Box 184, Accra, Ghana.
E-mail: Irene.agyepong@ghsmail.org; iagyepong@hotmail.com.

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Implementation of policies (decisions) in the health sector is sometimes defeated by the system’s response to the policy itself. This can lead to counter-intuitive, unanticipated, or more modest effects than expected by those who designed the policy. The health sector fits the characteristics of complex adaptive systems (CAS) and complexity is at the heart of this phenomenon. Anticipating both positive and negative effects of policy decisions, understanding the interests, power and interaction between multiple actors; and planning for the delayed and distal impact of policy decisions are essential for effective decision making in CAS. Failure to appreciate these elements often leads to a series of reductionist approach interventions or ‘fixes’. This in turn can initiate a series of negative feedback loops that further complicates the situation over time. In this paper we use a case study of the Additional Duty Hours Allowance (ADHA) policy in Ghana to illustrate these points. Using causal loop diagrams, we unpack the intended and unintended effects of the policy and how these effects evolved over time. The overall goal is to advance our understanding of decision making in complex adaptive systems; and through this process identify some essential elements in formulating, updating and implementing health policy that can help to improve attainment of desired outcomes and minimize negative unintended effects.

Keywords Complex adaptive systems (CAS), process, decision making, systems thinking, causal loops, implementation

KEY MESSAGES

- Thinking about health systems as complex adaptive systems (CAS) is an essential step in directing the current global interest and debate about how to strengthen health systems in LMICs towards achieving the desired health systems goals. The Additional Duty Hours Allowance saga in Ghana illustrates the importance of this and the challenges and results of crisis driven, linear and reductionist decision making within CAS.
- Building capacity to understand and apply systems thinking principles in CAS, and how to evaluate and consider alternative reform pathways within such systems, should be an important component of efforts to strengthen health systems of LMICs.
- Capacity building should include social science skills such as stakeholder analysis, listening and dialogue, ongoing systematic examination of consequences, inclusion of and brainstorming with relevant stakeholders, negotiation and conflict resolution.

Introduction

In 1998, the salaries of doctors working in the Military Hospital in Accra, part of the Ministry of Defense, were raised. The salaries of the rest of public sector doctors in Ghana remained unchanged. This event became the trigger for a nationwide doctors strike. The strike led to the decision by the government to introduce an allowance calculated and paid over and above a doctor's salary for hours worked beyond the standard 40 hours per week on which public sector salaries are paid, known as the Additional Duty Hours Allowance (ADHA). This decision in turn became the trigger for a series of events that would grip, dominate and periodically bring service delivery to a near halt over almost a decade. Why and how did a seemingly small decision, in a small part of the health system, become the trigger for such large effects? Why and how did the cycles of reaction and counter-reaction continue to generate ever-widening circles of ripple effects over nearly a decade before finally settling down, albeit uneasily? A simple analysis of strikes over the 50 years' existence of the Ghana Medical Association (GMA) from the Ghana News Agency Archives found that there has been more reported strikes over the 10 years of the GMA which coincide with the ADHA than the previous 40 years of its existence (Adjei 2011). In this paper we raise and explore these and related questions.

'In everyday life the distinction between policy and decision is often blurred' (Walt 1994) and we use the terms decision making and policy making synonymously. Implementation of new policies in the health sector is sometimes defeated by the health system's response to the policy itself. This can lead to counterintuitive or unanticipated effects; what Sterman (2006) describes as 'policy resistance'. Policy makers are constantly facing this dilemma of interventions introduced with high hopes that end up failing to deliver the anticipated outputs or leading to unanticipated effects. A classic historical example is the successful malaria eradication programme in Europe and North America in the 1950s, which led to the expectation that worldwide malaria eradication was feasible. After multi-million dollar investments, the project had to be abandoned in the poorest parts of low- and middle-income countries (LMICs), of which sub-Saharan Africa constitutes a substantial portion. Technical problems such as increasing resistance of the mosquito to DDT and weak health systems were among stated reasons for the failure of eradication. However, as Farid (1980) suggested, there were also important contributing factors related to the 'soft sciences' (Black 1980)—human behaviour, economics, politics—rather than the frequently cited technical reasons (Glen 1988; Najera 1989).

Health systems share the characteristics of complex adaptive systems (CAS) (Paina and Peters 2011). Although made of separate parts, they can only be fully understood by appreciating the relationship and interconnectedness between the parts (Senge 1990; de Savigny and Adam 2009). They are constantly changing, governed by feedback, and intervening in one part of the system will almost always have ripple effects in other parts of the system. CAS self-organize and adapt based on experience. Phenomena of relevance include path dependence, feedback loops, scale free networks, emergent behaviour and phase transitions. Path dependence means that from the same starting point, an occurrence can have several different

non-reversible paths with different outcomes. The history constrains the possible direction of future decision making. Feedback loops occur when the output of a process within a system becomes the input of another process. Scale-free networks have a few influential focal points or hubs with an unlimited number of linkages. Influencing the hub can cause a disproportionate effect in the network. Emergent behaviour refers to the spontaneous creation of order within a system, e.g. smaller entities come together to jointly contribute to organized behaviour and creation of a more complex whole. Emergent behaviour can be very difficult to predict. Phase transitions, also called tipping points or triggers, are critical points at which radical change takes place in a system (Paina and Peters 2011).

An important part of complexity in health systems are actors and stakeholders and their power in shaping and responding to change in decision making and implementation (Walt 1994; Erasmus and Gilson 2008). Inadequate attention to power, interests and values is a common precursor to unintended consequences and unsuccessful implementation of policies.

Through a range of tools and approaches, systems thinking calls for systematically exploring the interconnectedness between different components, and proactively thinking and anticipating the likely effects of policies, positive or negative, on the various components as well as the full range of actors and stakeholders in CAS (de Savigny and Adam 2009). In this paper, we apply systems thinking concepts in an analysis of the ADHA saga. The overall objective is to advance our understanding of decision making and outcomes in health systems, why policies sometimes fail to fully achieve their intended objectives and even produce unplanned effects; and how can we mitigate these undesirable and unanticipated effects.

Methods

The methodology is a case study of decision-making processes around the ADHA policy. We chose the case study as the most appropriate methodology because it is an 'investigation of a contemporary phenomenon in depth and within its real life context especially when the boundaries between the phenomenon and the context are not clearly evident' (Yin 2009). Sources of data were mainly secondary from review of grey and published literature, policy documents and memoranda. We also drew on primary data from our observations as actors in the health sector,¹ and therefore as participants in some of the processes described. Finally, we invited some actors in the ADHA saga, who were willing and able, to read through and comment on our draft for the validity of our documentation, analysis and conclusions.

To obtain the secondary data, key institutions, individuals and groups in the ADHA saga, such as the Ghana Medical Association (GMA), the Ghana Registered Nurses Association, the Health Workers Group, the Ghana Health Service and the Ministry of Health (MOH), were contacted for permission to search their records and archives of non-confidential documents, memoranda, communiqués and agreements related to ADHA. The Ghana News Agency archives were also searched for records on the ADHA saga, since the wide societal effects of many of the events meant that they were widely covered by the press. A simple Google search with the terms "additional duty

hours allowance” and “Ghana” was conducted, in addition to a PubMed search with the same search terms. References in materials found were also searched to see if they led to more material. The secondary data search was not intended to be exhaustive. It was stopped when no new information was being found to answer the questions of this study. The period covered is the little over a decade between 1998 and 2010.

Analysis

The analytic framework used in this paper (Figure 1) derives from, and builds upon, systems thinking concepts, including Sterman’s (2006) conceptual model of policy resistance. Policy resistance describes the situation in which the attainment of the goal of an intervention within a CAS is thwarted by the response of the system to the intervention itself. It arises from a ‘narrow, reductionist world view’ and a related ‘mismatch between the complexity of the systems we have created and our ability to understand them’ (Sterman 2006). A decision, action, inaction or some other intervention within a system, acts as a tipping point or trigger that leads to a response by another actor or group of actors. This response can be intended, unintended or a mixture.

The environmental context within which these events occurs further influences and is influenced by the events, adding yet another dimension of complexity. Figure 1 is of necessity a simplification. The ideal diagram would be three-dimensional

and longitudinal, with each cycle feeding into the next cycle through interrelated causal loops over time.

The material from the documents was analysed by first constructing historical timelines of events and mapping key actors and stakeholders. Next the processes, and cycles of decisions, actions and reactions, intended and unintended effects, triggers, networks and emergent behaviour were identified. The information was used to develop causal loop diagrams using Vensim software. Finally, the analysis was synthesized into conclusions and recommendations.

Causal loop diagrams provide a visual means of articulating our understanding of the complex relationships, dynamics and interconnectedness between the different components of a system. They help in thinking through the anticipated and unanticipated effects of intervening as well as the relative influence or impact of relationships (Kim 1992). They are most useful when relationships between different events or variables are non-linear. The relationship between two variables is depicted by an arrow showing the direction of influence. Adding positive and negative signs on the arrow describes the relationship between the two variables. A positive sign implies that an increase in one variable causes an increase in the other variable, so the change is in the same direction, while a negative sign implies that the change is in the opposite direction. A feedback loop occurs when a variable, through a series of other variables, is connected back to itself. A feedback loop may be reinforcing a situation (R), that is, representing a growing or declining action (movement escalating and

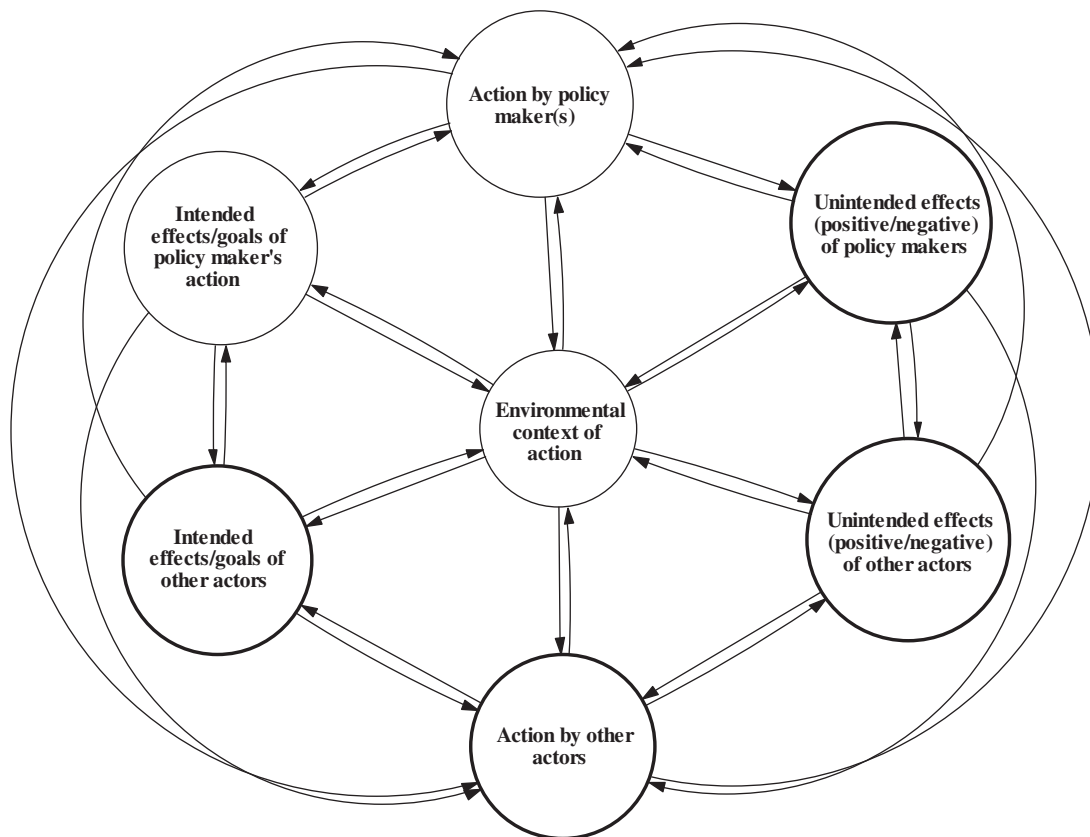


Figure 1 Analytic framework

reinforcing itself in one direction), or balancing it (B) by a neutralizing or self-regulating action (Kim 1992; Rwashana *et al.* 2009).

The environmental context

Ghana's gross domestic product (GDP) per capita is estimated at US\$1542 or I\$2930 [Purchasing Power Parity (PPP)] in 2010 current prices (Global Finance 2011). It is an agricultural country and its main exports are cocoa, timber and gold. Most of its estimated 24 million population are employed in the non-formal sector, and about half the population is below 15 years. A little under 15% of the public sector budget is allocated to health (MOH 2009). Mortality of children under 5 years declined from 155 per 1000 live births in 1983–87 to 108 in 1994–98, appeared to stagnate at 111 between 1999–2003, but is now declining once more, with the 2008 Ghana Demographic and Health survey estimating under-5 mortality rates at 80 per 1000 live births (GSS *et al.* 2009a). Maternal mortality declined from 503/100 000 in 2005 to 451/100 000 in 2008 (Bhutta *et al.* 2010; GSS *et al.* 2009b).

Brain drain and shortages of highly trained and skilled human resources for health has been and remains a problem (Dovlo and Martineau 2004; Anarfi *et al.* 2010). Dovlo and Martineau (2004) estimated that between 1986 and 1995, 60% of doctors from the country's main medical school emigrated, mainly to the US and the UK. Low salaries, which were at the heart of the ADHA saga, were and remain one of the many motivators for migration. It is a problem not unique to Ghana (McCoy *et al.* 2008).

The average monthly basic salaries for junior and senior doctors in Ghana were about US\$199 and US\$272, respectively, at the start of the ADHA saga in 1998 (Dovlo and Martineau 2004). Client to public sector health professional staff ratios were and remain high and workloads heavy, because of staff shortages. In their 2005 survey of health workers providing maternal health related services in two regions of Ghana, Witter *et al.* (2007) found mean hours of work per week ranged between 129 for Medical (Physician) Assistants to 54 for community health nurses. Public sector midwives had 19 deliveries on average per week compared with 4 for private sector midwives. In 2002, Ghana was estimated to have 6.2 physicians per 100 000 population compared with 279 in the US and 164 in the UK (Hagopian *et al.* 2005). A few years before the events described in this paper, doctors had fought without success for overtime payment, as in the United Kingdom. The ADHA saga was a problem waiting in the wings for its cue to come on stage.

Prior to the passage of the Ghana Health Service and Teaching Hospitals Act in 1995, the health sector comprised the Ministry of Health, which was both the regulator of the public and private sector, the body responsible for health sector policy direction, co-ordination, monitoring and evaluation, and the provider of public sector services. The Ghana Health Service and Teaching Hospitals Act 525 created an agency model in the health sector. The Ministry of Health became a small civil service ministry with responsibility for overall sector policy making, co-ordination, monitoring and evaluation. The Ghana Health Service and Teaching Hospitals became autonomous

agencies of the Ministry of Health responsible for public sector service delivery. There was a lot of expectation among health workers who believed the autonomous status would enable the Ghana Health Service to negotiate salary increases outside the constraints of the civil service. But this did not immediately materialize as the legislative instrument was never approved by the various Ministers who could not deal with the concept of autonomy.

There was no labour law at the start of the ADHA saga. It was several years on, in 2003, when the Labor Act 651 was passed by parliament to 'consolidate the laws relating to labor, employees, trade unions and industrial relations'. The labour law more or less formalized mechanisms that already existed; but also created a labour commission to mediate disputes. The law allowed strikes and lockouts under certain conditions, but made it illegal for employers or workers engaged in essential services to resort to lockouts or strikes in connection with any industrial dispute. It was unclear how the illegality clause was supposed to be enforced. Non-complying union leaders and their followers could not be arrested by police and the courts could not cause their arrest. It was also unclear what alternative redress mechanisms considered mutually satisfactory were now provided for essential workers if they still felt their issues had not been addressed despite following the dialogue and conflict resolution mechanisms prescribed by the law. The delayed administrative and bureaucratic responses and breakdowns of negotiations, dialogue and trust that fed the cycle of strikes continued. Effectively, that portion of the law did not make any difference to how business was conducted. The unions just ignored it and continued to use strikes as their finally bargaining tool.

The ADHA saga: actions, decisions, intended and unintended effects

In this section we describe the decision-making processes related to the ADHA over time. Figure 2 depicts the events using a causal loop diagram. The trigger (the Military Hospital doctors' pay rise) is the start of the events and the feedback loops under analysis. In Figure 2, satisfaction could be high (+) or low (-). The arrows and the +/- symbols show the direction of influence. Thus, for example, the decreased doctor satisfaction led to a strike, which led to the introduction of ADHA for doctors and subsequently improved doctors' satisfaction (a 'balancing' loop of events). This decision, however, decreased nurse satisfaction and led to a nurse strike resulting in a new loop of events. The normal thickness arrows show the core causal loops related to decisions about implementing. The thicker arrows show the formation of additional causal loops due to payment delays, resulting in 'reinforcing' loops of events (delays—increased dissatisfaction—strikes—more delays—more dissatisfaction—more strikes etc.). Table 1 summarizes key actors, interests and power in relation to the processes described.

1998: initiation phase—introduction of the ADHA

In 1998, the '37' Military Hospital, part of the Armed Forces Medical Services under the Ministry of Defense, effected what

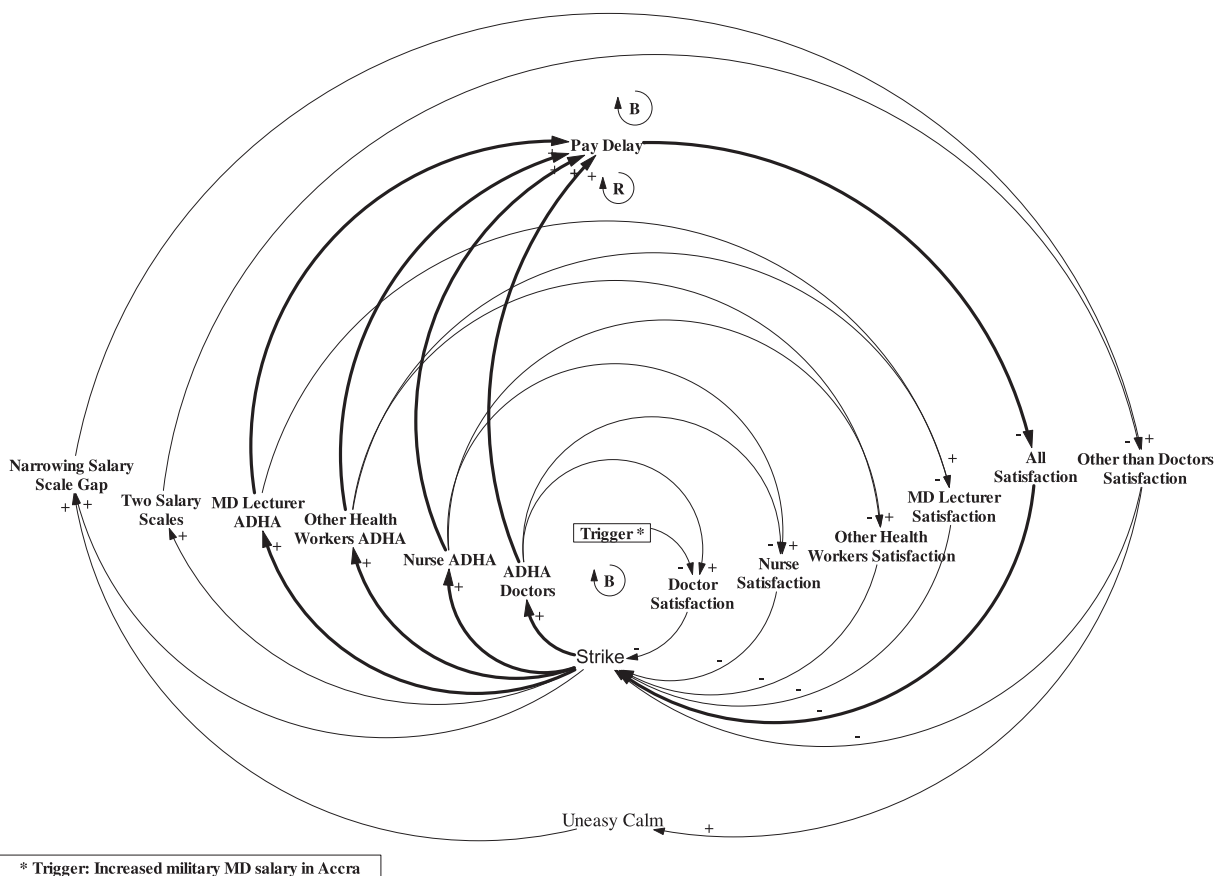


Figure 2 Causal loop diagram of the decision-making processes related to the ADHA

amounted to wage increases for its doctors. It appears the Military Hospital made this move because for a number of years it had not been able to attract young doctors and the seniors were getting on in age. The hospital therefore decided to entice young doctors with increased remuneration and justify the amount as ‘some allowances’. There had been longstanding discontent among doctors in the public sector, mainly employees of the MOH, over their extremely low wages. Junior doctors, who on average work longer hours than senior doctors, and are unlikely to have their own private clinic, were particularly restless over the issue. Not surprisingly, they were the first to agitate for and initiate industrial action, using the disparity created between the pay of doctors employed by the Ministry of Defense and that of other public sector doctors as a ‘trigger’ or ‘tipping point’ to take action on their longstanding discontent over remuneration. Their action received the backing of their senior colleagues and the GMA declared a nationwide doctors strike to back their demands for pay reform. The GMA presented the government with three options for satisfying the striking doctors. They were: (1) salary increases, or (2) compensation for work overload, or (3) compensation for long hours worked beyond the standard 40 hours per week in the form of an ADHA. All three were ideas that had been floating around the GMA for some time as possible solutions to the simmering discontent over conditions of service.

Doctors employed in the public sector provide a large part of services in the health sector. There is a thriving licensed private

sector, but it is predominantly in the metropolitan and larger urban areas, and not affordable for poorer people. In rural areas, apart from the Christian Health Association of Ghana, the only other service delivery options are those provided by the MOH/Ghana Health Service. The strike therefore effectively brought health service delivery in Ghana to a near halt. There was a public outcry, with the press and the public generally sympathetic to the doctors and demanding that the government appease them rapidly so that services could be restored.

The government entered into negotiation with the GMA and selected the payment of an ADHA out of the three options. It appears the government picked this option to buy time and also because the Ministry of Finance felt that given their low numbers, such a payment for doctors only would not make much noticeable difference to the government budget for the year. Last but not least, it was also felt to be generally true that doctors were indeed working extremely long hours. A Memorandum of Understanding (MOU) was signed between the government and the GMA, to take effect from 1 January 1999. Since the GMA represents doctors as well as dentists, the arguments were made for both groups and the ADHA was to be calculated based on an hourly rate, derived from the salary of the medical or dental practitioner in question. The GMA called off its strike; but with the proviso that if by 1 of March 1999 the promised allowances had not been paid, they would resume the industrial action without any warning. These events are depicted by the inner circle in our causal loop diagram showing

Table 1 Actors and their power, their exercise of power, objectives in exercising power (where it can be discerned), and intended and unintended effects achieved from perspective of different key actors

Actor	Power	Exercise of power	Objectives	Actual effects
Military Hospital (part of Ministry of Defence)	Part of a sensitive sector with known power to bring down governments (history of military coups)—in which government tries to provide adequate privileges to pre-empt dissent.	Obtain increased wages for doctors it employs to provide services to the military and their families.	Could not be found from document reviews. However, it is known that there was universal discontent among health workers in the country over low wages. Hospital could not attract young doctors.	Doctors in the Military Hospital are satisfied. Doctors in public agencies are dissatisfied by the selective addressing of a universal cause of doctor discontent. Provides a trigger for simmering national doctor discontent over public sector wages to blow into a full-scale industrial action.
Doctors/Ghana Medical Association	Rare skills, limited numbers, long training period, difficult to replace. Major public respect and influence because of their actual and potential large clientele of citizenry (all voters) for whom they are seen to hold power of discretion and decision making over 'life and death' issues by virtue of their knowledge and skills services. High internal private sector and international demand and therefore other options for employment, with resulting already existing high brain drain. Well-organized cohesive union with leaders trained and experienced in negotiation and management of industrial conflict.	Withdrawal of services to their large clientele.	Get better pay.	Major life and death inconvenience and threats to clients with resulting public discontent and agitation on the side of the doctors that government immediately addresses the pay issues. Government is forced to act on public sector doctor remuneration and chooses the option of increased pay through ADHA for doctors.
Government: Ministry of Health (MOH)	Control of state resources and executive power. Responsible for health sector policies, including those related to human resources. However, has to defend and get approval from MoFEP for any budgets.	Approved the proposal to increase wages through a selective professional group ADHA system.	Get striking health workers back to work as soon as possible without radical public sector pay reform.	Temporary resolution of problems with the particular professional group union on strike at any time. Piecemeal approach creates a domino effect where excluded groups in each piecemeal reform use their 'union' power to get inclusion. Incremental rapid increase in wage bill as more and more professional groups are included.
Government: Ministry of Finance and Economic Planning (MoFEP)	Control of state resources and executive power. Decision maker on public sector budget allocations to Ministries, departments and agencies. The most financially powerful of the three ministries that represented government in the ADHA negotiations.	Approved the selection of an ADHA payment to doctors in 1998. Later, when the massive health sector wage bill increased, the MoFEP tried to avoid by selecting ADHA had occurred anyway, approved the consolidation into a salary reform in the health sector.	Felt the amount involved would not distort national budget allocations. Avoided the 'raise salaries' option because it would have had to be comprehensive across the sector rather than selective for doctors. The wage bill would have gone up drastically and other public sector workers beyond health would have had a window opened to agitate for salary increases. Approved the consolidation into salaries since they had been forced to make the financial allocations they were avoiding and the more systemic approach of consolidation into salaries was expected to bring industrial peace and also make it easier to control the constant rise in the wage bill.	The linear attempt to introduce a selective reform in a part of the health system only (doctors) opened a window for other professional group unions to exert their power to also get ADHA allocations. In the end the massive wage bill increase that was being avoided occurred. Consolidation of ADHA into health sector worker salaries eventually produced an uneasy calm. However, the window was now opened for professionals other public sectors, e.g. teachers, to start agitation and strikes for improved conditions of service.

(continued)

Table 1 Continued

Actor	Power	Exercise of power	Objectives	Actual effects
Government: Ministry of Employment and Social Welfare (MoESW)	Control of state resources and executive power. Responsible for general public sector employment policies.	Supported the selection of the ADHA option.		
Nurses/Ghana Registered Nurses Association	For the more highly trained cadres, e.g. midwives, diploma, graduate nurses, etc: rare skills, limited numbers, difficult to replace. High internal private sector and international demand and therefore other options for employment. Well-organized and cohesive union with leaders trained in negotiation and management of industrial conflict. Public respect and influence because of their actual and potential large clientele of citizenry (all voters) for whom they are seen to hold power of discretion, and decision making over 'life and death' issues by virtue of their knowledge and skills services. However, lower than the doctors' influence and some public perception that some nurses can be exceptionally 'rude and uncaring'.	Increase wages through the ADHA system.	Get better pay by inclusion in ADHA.	Major life and death inconvenience and threats to clients with resulting public discontent and agitation on the side of the doctors that government immediately addresses the pay issues. Government is forced to act on public sector doctor remuneration and chooses the increased pay through ADHA for doctors. Better pay through ADHA system.
Other health worker groups	Health sector is highly inter-dependent, and even seemingly 'unimportant' groups become very important when they form coalitions and lay down their tools together.	Different unions form a coalition, align with the nurses' unions and join forces in a 'health workers group' strike.	Get better pay by inclusion in ADHA.	Major life and death inconvenience and threats to clients with resulting public discontent and agitation that government immediately addresses the pay issues. Government is forced to act and further expands groups entitled to ADHA. Better pay through ADHA system for almost all health sector workers.
Clients	Votes	Outcry through the media to have health services restored.	Continue to obtain health care.	Indirectly help push government/MOH to introduce ADHA, expand ADHA and maintain ADHA. However, their sympathy and respect for doctors and other health workers diminish with each cycle of suffering they endure.
Media	Ability to rapidly convey messages to large numbers of potential voters and shape perceptions (power as thought control). Most media in Ghana is private and—in theory at least—independent of the executive.	Wide and continuing coverage of the health workers strikes and the major negative effects on the life and death issues of clients.	As potential and actual clients themselves they want services restored. Controversy, a good real life drama and stories of local and human interest sell and increase listenership, viewership and circulation.	Government does not like to appear publically in a negative image and as incapable of addressing life and death issues rapidly or lose popularity and therefore votes, or even potentially have large street protests and demonstrations on their hands. They introduce, expand and maintain ADHA.

the arrow from low doctors' satisfaction, to a strike and then to ADHA for doctors, which then raised doctor satisfaction—for a time at least.

In early February 1999, the Ministry of Health released a memo to all regional directors and other administrative levels containing guidelines for implementing the ADHA policy. The guidelines stated that payment of ADHA was to be done at the facility level with retrospective effect from 1 January 1999. Facilities were to prepare monthly duty rosters for doctors and dentists to ensure 24 hours service. Regional directors of health services and heads of facilities were to monitor implementation arrangements. A review of implementation experiences was planned for May 1999.

Funds for the ADHA were approved and released on 26 February 1999 to all the 10 regions and the two teaching hospitals. However, administrative and procedural delays meant that by 1 March ADHA had not been paid. A new cycle of dissatisfaction was created, this time from ADHA to payment delay to reduced satisfaction to a strike, as illustrated in the causal loop diagram. On 1 March 1999, junior doctors across the country laid down their tools at what they perceived as a breach of the agreement. However, they resumed work on the appeal and reassurance by the GMA, who had been working with government to resolve the administrative problems, that the money had been released and payment was about to commence.

The MOH tried to exclude medical officers working in administration in the regional health directorates and MOH headquarters from receiving the ADHA allowances. The GMA wrote to the Minister of Health to protest and remind the Minister that as far as they were concerned the ADHA was 'an incentive to compensate for the abnormally poor basic salaries of the Medical and Dental practitioners in the public sector'. They reminded the MOH that the agreement was for '160 hours as the average annualized number of hours per month for the payment of the allowance', as documented in the records of the meeting held between the GMA and government that preceded the signing of the MOU.

1999–2000: expansion to all health care workers

The decision to give an ADHA to doctors, which led to doctors' satisfaction and temporary relief to decisions makers, now became the trigger for unintended consequences (from the point of view of decision makers) by further worsening already low nurse satisfaction over their remuneration. This is illustrated in Figure 2 by showing a causal loop from ADHA doctors to doctor satisfaction, but also to nurse satisfaction. Nurses had been watching the doctors strike and its outcome from the sidelines. They also had longstanding grievances over inadequate wages. In April 1999, junior nurses began a strike requesting that nurses also be included in the ADHA payments. They were supported by the Ghana Registered Nurses Association and the Nurse Anesthetists Association. A nationwide 7-day strike by nurses once more ground the health sector to a near halt. The strike ended with an agreement between the government and the nurses unions to include nurses in the ADHA payments, also with effect from 1 January 1999. Administrative requirements were introduced requesting that the overtime payments be calculated based on duty rosters,

authorized by the head of institution and verified by information from the attendance books.

The decision to include nurses in the ADHA payments not only created a feedback loop of improved nurse satisfaction, but in its turn became the trigger to create a feedback loop for reduced satisfaction and related unintended strike action (from decision maker viewpoints) by other health sector workers. Recognizing that their fragmented nature and small numbers made them ineffective in any negotiation to be included in the ADHA payments, the less powerful health worker unions, such as the Government and Hospital Pharmacists Association, the Medical Assistants Association, the Association of Laboratory Scientists and the Association of Health Service Administrators joined forces with the Ghana Registered Nurses Association. In what was essentially a form of 'emergent behaviour' (Painá and Peters 2011), they labelled themselves the 'representatives of health workers other than doctors' and also demanded that the MOH include them in the ADHA allowances, or else they would strike en masse.

By September 1999, in response to the strikes and agitations, virtually all permanent workers in the health sector were included in the ADHA. The MOU for ADHA between government and the other health workers' associations was based on three conditions: payment would be for additional hours beyond the standard 40 hours per week; timesheets should be kept by each individual staff member; and they should be crossed checked and verified by management before payment. The MOU was signed on the 30 September 1999.

While medical doctors working in teaching hospitals as employees of the MOH were included in the ADHA, those working as full-time lecturers in the medical schools, and therefore employees of the Ministry of Education, were not. Doctors teaching in the medical schools threatened to stop teaching and to go back into practice in the MOH to improve their salaries. In response, an MOU was also signed between the MOH and the medical school for them to be included in the ADHA payment.

2001–2005: implementation of expanded ADHA

The expanded ADHA scheme, including almost all permanent staff in the health sector, did not lead to industrial peace despite the fact that, as Table 2 illustrates, the ADHA payments were often more than the staff salaries themselves and led to a doubling or more of staff incomes.

There were repeated delays in payment and further strikes by doctors and nurses due to late payment of the ADHA. Thus yet another cycle of feedback and causal loops was established, as illustrated in Figure 2. The ADHA claims rose steadily. The MOH introduced regional and institutional financial ceilings on the amount of ADHA to be paid to limit the rapid growth in costs. It was not completely successful and the ADHA bill continued to rise. The government continued to have difficulties in prompt payment, leading to threats of strikes and actual strikes by health workers to enforce payment. The health sector entered a vicious cycle of payment delay followed by strike to enforce payment, followed by payment to end strike and back again. The cycles appeared to have the additional side effect of creating in the mind of the health workers and their unions that the only language government responded to was industrial

Table 2 Sample of salaries and ADHA payment for professional health staff in June 2004

Grade of professional	Basic salary		ADHA Gross amount (Cedis)	Net ADHA (less 15% tax)	
	Cedis	US\$		Cedis	US\$
Specialist doctor	4 247 762.00	474.50	9 291 979.38	7 898 182.47	882.28
Senior Medical Officer	3 661 573.00	409.02	8 009 690.94	6 808 237.30	760.53
Medical Officer	2 405 818.00	268.75	5 262 726.88	4 473 317.84	499.70
Principal Nursing Officer	2 977 389.00	332.59	4 559 126.91	3 875 257.87	432.89
Senior Nursing Officer	2 421 419.00	270.49	3 707 797.84	3 151 628.17	352.06
Nursing Officer	1 775 136.00	198.29	2 718 177.00	2 310 450.45	258.09
Senior Pharmacist	2 802 088.00	313.01	4 290 697.25	3 647 092.66	407.41
Pharmacist	2 686 183.00	300.07	4 113 217.72	3 496 235.06	390.55

action rather than mere dialogue and trust that agreements would be honoured.

The repeated delays in payment of the ADHA were attributed by government to the non-submission of the required verified time sheets by the respective administrative levels to enable payment. While there were delays in submission of these returns, it was not clear that this was the full story, given that there were cases where even when submissions had been made, there were still delays in payment. It appeared that some, if not all the delays, were due to government challenges in meeting the mounting bills. For example, on at least one occasion when a delegation from the GMA descended on the MOH because of ADHA arrears owed, the then Minister for Health was at his wits' end. He therefore took them to the Minister for Finance. The Minister for Finance was not exactly delighted when he saw them because he had not been informed earlier of the problem. However, he called his technical men and told them to look carefully at the MOH budget and find out where they could safely take the money from. They returned after a few minutes and provided the answer—the MOH capital budget for that year. That year no new project could be undertaken.

There were also ADHA management problems within regions and facilities that fuelled the discontent and unrest. The ADHA ceilings often remained constant and did not necessarily change with changes in staffing. There was uneven application of rules on limits and time accounting. Thus while some institutions had enough to pay and more, others had too little. Staff compared notes and found that similar categories of staff doing similar work in different institutions received widely varying amounts. Further widening the discrepancies, institutions that generated more funds from out-of-pocket fees could use those funds to make up for the deficit payments for their staff to maintain some peace and keep services running, while less endowed institutions had to make do with whatever they got. Many institutions had staff they employed locally and paid from their internally generated funds. These staff were not included in the ADHA payments. They were often low paid and unskilled or semi-skilled staff. These inequities generated by the management of the ADHA created staff dissatisfaction alongside the satisfaction of better remuneration (Agyepong *et al.* 2004).

Filling of individual time sheets and vetting of hours claimed proved an impossible and unpopular task and a major administrative burden. Many institutions implemented an unofficial local 'ADHA Committee' to try and manage the administrative

burden and reduce staff discontent related to perceived unfairness in allocation.

The ADHA budget rose from about US\$1.5 million to over US\$84 million by 2005 (Ruwoldt *et al.* 2007). The percentage of the recurrent Government of Ghana budget spent on health rose from 10.2% in 2001 to 14% by 2006, with salaries accounting for the bulk of the rise. The percentage of the recurrent budget spent on non-salary items fell slightly over the same period from 8.1% to 7% (MOH Ghana 2007). Salaries were accounting for over 75% of central government allocation to the health sector and once capital investments were also accounted for, less than 10% of central government funds remained for recurrent expenditure (Dubbledam *et al.* 2007). Effectively, non-salary recurrent expenditure was running on donor funds and internally generated funds from user fees in the health facilities and, as the National Health Insurance scheme picked up after 2004, on national health insurance reimbursements to the facilities. Several donors were uncomfortable with this, as they perceived that their money was substituting for the salary increases.

In addition to the simmering discontent, industrial unrest and rising wage bill in the health sector due to the ADHA implementation problems, there were mounting concerns that the overall increase in health expenditure did not seem to translate into improvements in key health sector indicators as witnessed by the stagnating/slow decline in maternal and under-5 mortality. Health sector indicators are influenced by several variables and it is difficult to attribute one particular reason for observed levels. However, given the legitimate concerns about the insufficient improvement in key health indicators, all policies in the sector over this period—including ADHA—were under scrutiny and question.

The government initiated discussions to consolidate the ADHA into salaries. A job evaluation was commissioned in February 2005 to evaluate the various health sector job portfolios. The government issued the report 'Restructuring the ADHA' in September 2005 (MOH 2005), and a circular formalizing the consolidation of ADHA into salaries. The last ADHA payment was to be in December 2005.

2005–2007: formulation of integration of ADHA into salary reform and implementation

The process of consolidating the ADHA into salaries became the next trigger for industrial unrest in the health sector. This time,

the industrial action by doctors, nurses and other health care workers was over the terms of consolidation and delays in the first new salary payment. There were conflicts and strikes over the creation of two pay scales: Health Sector pay Scale 1 (HSS1), at a higher level for doctors, and Health Sector pay Scale 2 (HSS2), at a lower level for everybody else. Doctors, satisfied for the time being with their negotiated pay scale, did not go on any further strikes. However, all other workers in the sector were aggrieved over what they perceived as an unfair policy. They formed a coalition called the Health Workers Group and went on crippling strikes demanding a single pay scale and higher consolidated salaries. Between 2006 and 2007 the health sector went through a stormy period as government and the worker unions conflicted over the issues. The health workers unions employed the services of a labour expert and Chief Executive Officer of a labour consulting group, to represent them before the labour commission and negotiate with government on their behalf.

2008–2010: implementation of salary reform/an uneasy calm

In June 2008, the negotiations were finally completed to everyone's acceptance, if not full satisfaction. There were still two pay scales but the gaps had been narrowed. The first payment of consolidated salary, back dated to January 2006, was made. The cycles of ADHA-related strikes and industrial unrest reached an uneasy calm with unions keeping a watchful eye on the implementation. To try to reduce expenditure, government temporarily froze promotions to avoid further pay rises. This constituted another source of watchful uneasiness on the part of the unions. Secondly, once ADHA had been consolidated into salaries, it was no longer a 'special health sector reform', but public sector salary reform. It opened the door for other sectors of the economy to start agitating about their conditions of service. There was a major strike and agitations by graduate teachers for salary reform. Government started working on proposals for the design and implementation of a public sector single spine salary reform. This next generation of reform is not the subject of this paper. It is enough to mention that at the time of writing of this paper, there had been a doctors strike over the details of this reform, as well as threats of strikes and actual strikes by other health professionals (nurses, pharmacists, laboratory scientists, etc.) and continuing negotiations. It is mentioned to buttress the point that the end of the ADHA saga was an uneasy calm rather than a perfect solution.

Discussion and conclusions

This case study illustrates the challenges of crisis-driven, linear decision making within a CAS. The cycles of industrial action related to the ADHA are a striking illustration of feedback loops as a reaction to intervening in the system and offer lessons on how 'the solutions of yesterday become the problems of today'. Systems thinking can help to greatly mitigate, though probably not completely avoid, all such problems. Systems are unpredictable and reactions can sometimes be counterintuitive despite the best of efforts. To greatly mitigate them requires a

deeper understanding of the fundamental characteristics of complex adaptive systems and putting in place processes to continuously assess and interpret changes in the system and its actors, and based on this understanding initiate rapid responses.

Systems thinking concepts and tools, such as the causal loop diagrams used in this analysis, are very valuable approaches for policy analysis and dialogue and are relevant to researchers, policy analysts and decision makers alike. Wider application of systems thinking concepts by researchers and policy analysts interested in generating and refining frameworks and theories around health systems will advance our understanding of public policy decision making, and the real reasons for the success and failure of policies. For decision makers, systematic application of systems thinking concepts in everyday decision making will undoubtedly improve the decision-making process and better inform the design of new policies and programmes. It will also minimize the short-sighted, crisis-ridden, problem-solving approaches, illustrated in this case study.

Retrospective analysis of policies, as in this case study, is very helpful in drawing lessons and insights for the future from the experiences, successes and failures of the past. But prospective analysis is also critical. In the ADHA case for example, we think that a prospective mapping of stakeholders, their interests and power, and the use of force field analysis and causal loop diagrams to anticipate the possible effects of decisions throughout the process, would have enabled a less drawn and stormy policy development and implementation process. It could have anticipated the impact of delays in payment of ADHA on health workers' morale and the mounting feedback loops of lowered satisfaction, anger and strikes. This analysis could also have mitigated longer term damage such as loss of 'trust' in the system, which is very well illustrated in this case study. After each strike, the government mobilized its resources to release the ADHA and stop the strikes. However, the damage of trust that agreements between health worker unions and government could be reached and honoured without strikes was already done.

As this study shows, while systems thinking concepts are well known in other fields, their use in the health field is still in its infancy, despite its great relevance and prospects. Systems thinking constitutes a paradigm shift from the traditional linear way of thinking that has governed the basic training foundations for most of us working in the health field, to a more dynamic thinking that appreciates the complexity of the health system and its actors, the importance of context and processes, and the value of continuously learning from and evaluating policies as they are implemented (Adam *et al.* 2012). An important element of applying this way of thinking is understanding how to think across disciplinary boundaries (Bennett *et al.* 2011). Decision makers in health systems in LMICs need to be provided with training in systems thinking and the use of policy analysis and systems thinking tools and approaches. In such capacity building to strengthen decision making within health systems, the social sciences matter (Gilson *et al.* 2011). Such capacity building should include skills in political and stakeholder analysis, dialogue, systematic examination of consequences, inclusion of and brainstorming with relevant stakeholders, negotiation and conflict resolution.

This case study also generates questions for further exploration. To borrow the words of Sagoe (2004), the ADHA scheme was 'born in crisis and generally managed as crisis'. A question arising out of this is whether feedback loops that have large negative unintended effects, as happened in the ADHA saga, may be highly likely when decision making in CAS is characterized by crisis decision and ad hoc fire fighting approaches. A second, related question is whether such feedback loops are more likely to occur in a context such as that of this case study, where despite the hierarchical structure of the public sector, power is formal as well as informal and highly diffused (Agyepong and Nagai 2011); and the MOH and its public sector implementing agencies are effectively street-level bureaucracies (Lipsky 1980).

Yet another question of interest that this case study raises is 'what makes a particular factor likely to become a tipping point for major change in CAS at a given time?'. Low salaries and related staff dissatisfaction were longstanding problems in the health sector in Ghana. The GMA had unsuccessfully agitated for overtime payments a few years before the events of the ADHA saga, and the proposals put forward by the GMA in 1998 were not new. They had been 'floating' around in the thinking of the GMA for some time. In the case of the overtime payments, the idea appears to have come to the GMA from observation of the UK (the former colonial power in Ghana) health system.

Why did the military hospital pay rise becoming the tipping point for policy change at the point it did? The Kingdon (2003) theory of agenda setting is probably relevant as part, at least, of the explanation. Kingdon (2003) theorized that problems, policies (solutions) and the politics tend to exist independently within systems, each flowing in its 'stream'. However, periodically a situation arises when the problem stream, the policy (solution) stream and the politics stream meet. This meeting of streams becomes a window of opportunity that leads to action. The military hospital pay rise, in creating a pay differential for similar work, opened a window of opportunity that became a tipping point. The GMA already had possible solutions on hand waiting their opportunity; and the public outcry over the effects of the strike created the political impetus of a crisis. After the doctors strike, it appeared that the realization that the doctors had been able to initiate a solution to a longstanding joint problem through industrial action became a tipping point for other health worker groups and a further window of opportunity. In a CAS like the health system, there is an interface between policy analysis and systems thinking. Systems thinking should be a critical part of policy analysis and vice versa. This inter-relatedness should be factored into capacity building for decision makers.

A further lesson is the need to institute constant ongoing analysis as part of early warning systems for signs of 'potential trouble' in health systems. It is possible that if more attention had been paid to the simmering staff discontent in the health sector over wages and conditions of service, a less crisis ridden and more planned systems thinking approach to problem solving might have been possible. Once decision making becomes mired in crisis, it can be difficult to do the needed careful analysis of anticipated and unanticipated effects, and use of tools such as stakeholder analysis and causal loop diagrams.

In conclusion, the study and understanding of systems thinking and complex adaptive systems and capacity building for decision makers in this area cannot be ignored in the current global interest in strengthening health systems in LMICs towards achieving health goals.

Limitations of the study

This single case study provides useful pointers to areas for attention and further exploration rather than conclusively answering all questions. Its conclusions cannot be assumed to be transferable to other contexts without checking relevance. It needs to be built upon with comparative analysis of other case studies of crisis linear and non-linear decision making in complex adaptive systems in LMICs.

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Conflict of interest

None declared.

Endnotes

¹ Over the period of the ADHA saga explored here, IAA was a district director of health services and then a regional director, AK was working in the Ghana National Drugs Program of the Ministry of Health and SA was Deputy Director General of the Ghana Health Service.

² In 1998, the exchange rate was in the order of 2250–2350 cedis = 1 US\$; in 1999 the rate was 2350–3550 cedis = 1 US\$; and in 2005, 8900–9500 cedis = 1 US\$ (http://en.wikipedia.org/wiki/Ghana_cedi#Exchange_rate_history, accessed 19 November 2011).

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