

# Health Systems Resilience: A Systems Analysis



## A Case Study of Technical Assistance to HIV Services in Cote d'Ivoire in the Context of Civil Unrest Following the Disputed Presidential Election of 2010

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## HEALTH SYSTEMS RESILIENCE

*Health Systems Resilience: A Systems Analysis* is a project which seeks to apply a systems dynamics approach to understand, predict and identify mechanisms that influence the resilience of health systems in contexts of adversity. Resilience has emerged as a dominant concept underpinning development assistance and humanitarian support in contexts vulnerable – through conflict or natural disaster – to crisis. A systems dynamic approach, which lends itself to group model building through intensive, participatory consultation with stakeholders and representation and refinement of models using graphical systems tools, offers an effective means of exploring the determinants of systems vulnerability and resilience.

The project is implemented by the Mailman School of Public Health, Columbia University in collaboration with the School of Public Health, University of Western Cape. The work is funded by DFID through the ReBUILD program coordinated by the Liverpool School of Tropical Medicine and Queen Margaret University, Edinburgh.

A series of three case studies are planned during the course of the project. The first, a historical analysis, considered disruption of HIV services in Cote d'Ivoire following the disputed presidential election of 2010.

The case study was conducted principally from the perspective of the International Center for AIDS Care and Treatment Programs (ICAP) at Columbia University, an implementing partner funded by Centers for Disease Control and Prevention (CDC) under the U.S. President's Emergency Plan for Aids Relief (PEPFAR). ICAP provided technical assistance for HIV-related programming to the Ministry of Health during this period. ICAP supported family-focused and multidisciplinary HIV services in health facilities across the country, working to build district capacity for provision of

comprehensive HIV services<sup>1</sup>. These services included: pediatric and adult HIV care and treatment (including provision of ART); integrated tuberculosis/HIV care and treatment; rapid HIV testing for adults and children; diagnostic testing/analysis (including Dried Blood Spot DNA PCR testing for infants); community outreach; HIV support groups; and peer education programs.

While the Ministry of Health (MOH) provided salaries to the majority of health facility staff and was also responsible for the procurement of drugs, ICAP provided salary support to some staff at health facility level such as data clerks.

## DISRUPTION OF HIV SERVICES IN COTE D'IVOIRE FOLLOWING THE DISPUTED PRESIDENTIAL ELECTION OF 2010

The November 2010 presidential elections saw Alassane Quattara declared president over the incumbent leader, Laurent Gbagbo. Gbagbo contested the result and sought to retain power. This resulted in significant civil unrest, much of which related to the movement of forces loyal to Quattara towards the capital city, Abidjan, from their base in northern Cote d'Ivoire. As Quattara's forces moved south, there was significant fighting as they met resistance from forces loyal to Gbagbo.<sup>2,3</sup>

In some areas forces occupied hospitals, using them as their operating base. In some instances hospital equipment such as CD4 count machines and air conditioners was stolen or vandalized. Travel – especially along the main north-south corridor – was significantly disrupted. Banks were closed for a period of two months, which further exacerbated disruption.

<sup>1</sup> <http://icap.columbia.edu/where-we-work/cote-divoire>

<sup>2</sup> United Nations High Commission on Refugees (UNHCR). 2011. Donor Update: Côte d'Ivoire. Geneva: UNHCR.

<sup>3</sup> <http://fpc.state.gov/documents/organization/156548.pdf>

The country's health system was affected in terms of staff and patient movement to the clinics for a period of at least six months from November 2010 till April, 2011<sup>4</sup>. We received reports that in some areas patients had refused to receive treatment from health workers who had a different political affiliation to their own. There was severe disruption of the drug distribution mechanism through much of this period due to insecurity and difficulties with cash flow.

In addition, coordination among local stakeholders was affected as the violence escalated and some clinics could not be contacted via phone connections. Some of the ICAP staff that were based in Abidjan were evacuated to neighboring countries when the violence intensified in the capital city.



Map of Cote d'Ivoire. Source: World Fact Book, cia.gov

This situation clearly presented a major challenge to the continuation of HIV services. Interruption of supply of antiretroviral (ARV) medication represented not only a major risk to patients, but also wider concerns regarding the potential development of resistance.

The case study focused on the role of ICAP, in collaboration with the MOH and other stakeholders, in supporting service delivery during this period. The aim was to identify factors which contributed to the vulnerability of service delivery, and those factors which strengthened the health systems resilience in the face of major disruption.

## METHODOLOGY

The study involved four main phases. First was the scoping phase, which involved identification of key informants, review of background information on Cote D'Ivoire, and development and refinement of a structured interview guide (addressing analysis of the health systems challenges resulting from the civil unrest, strategies put in place to address them, and perceived 'lessons learned' from this period). Thereafter key informants were contacted and interviewed. Seven former and current ICAP staff based in Cote D'Ivoire and New York were interviewed. Core information from the interviews was synthesized and used to refine the scope of the study through formulation of a one page problem summary statement.



Core project team members consolidate identified themes

The second phase involved content analysis of interviews by the core project team and planning for the subsequent group model building session. Four members of the core project team reviewed interview transcripts and identified variables referenced by interviewees

<sup>4</sup> <http://www.irinnews.org/report/91834/cote-d-ivoire-political-crisis-affects-supply-of-arvs>

in accounting for health system performance during the course of the crisis. These variables were: information flow, cash flow, security, flow of drugs, human resources availability and capacity, human resources commitment and motivation, national leadership and coordination, availability of transport, flexibility in local decision making, changes in services provided, international support and coordination, and the influence of political affiliation.

An interrelationship diagraph (IRD) was then drafted as a first step to understanding the interrelationship between these variables in shaping the functioning of the health system in Cote D'Ivoire during the crisis. On the basis of the IRD, the core project team members then developed an initial formulation of linkages - a 'seed model' - to facilitate model building in phase three.



*ICAP staff engaging in discussion during the GMB session*

Third, the core project team facilitated a Group Model Building (GMB) session with a number of key informants. Four former or current ICAP staff from New York participated, along with two participants from Cote D'Ivoire who connected virtually for parts of the discussion. The session involved review and revision of key variables influencing health systems resilience during the crisis, and elaboration of themes and linkages through construction of a systems model (evolved from the initial seed structure shared). This systems model was developed collaboratively with the use of the

Vensim graphical software package<sup>5</sup>. Key stakeholders in addressing the crisis in HIV service delivery were thus engaged in building a preliminary systems model of the factors that shaped decision-making and health systems performance.

The fourth and final phase involved - in the period after the GMB session - the refinement of the preliminary systems model. Refinement was based upon revisiting stakeholder interviews in the light of the GMB discussion and utilization of service-related data made available to the team after the GMB session.

## STUDY FINDINGS

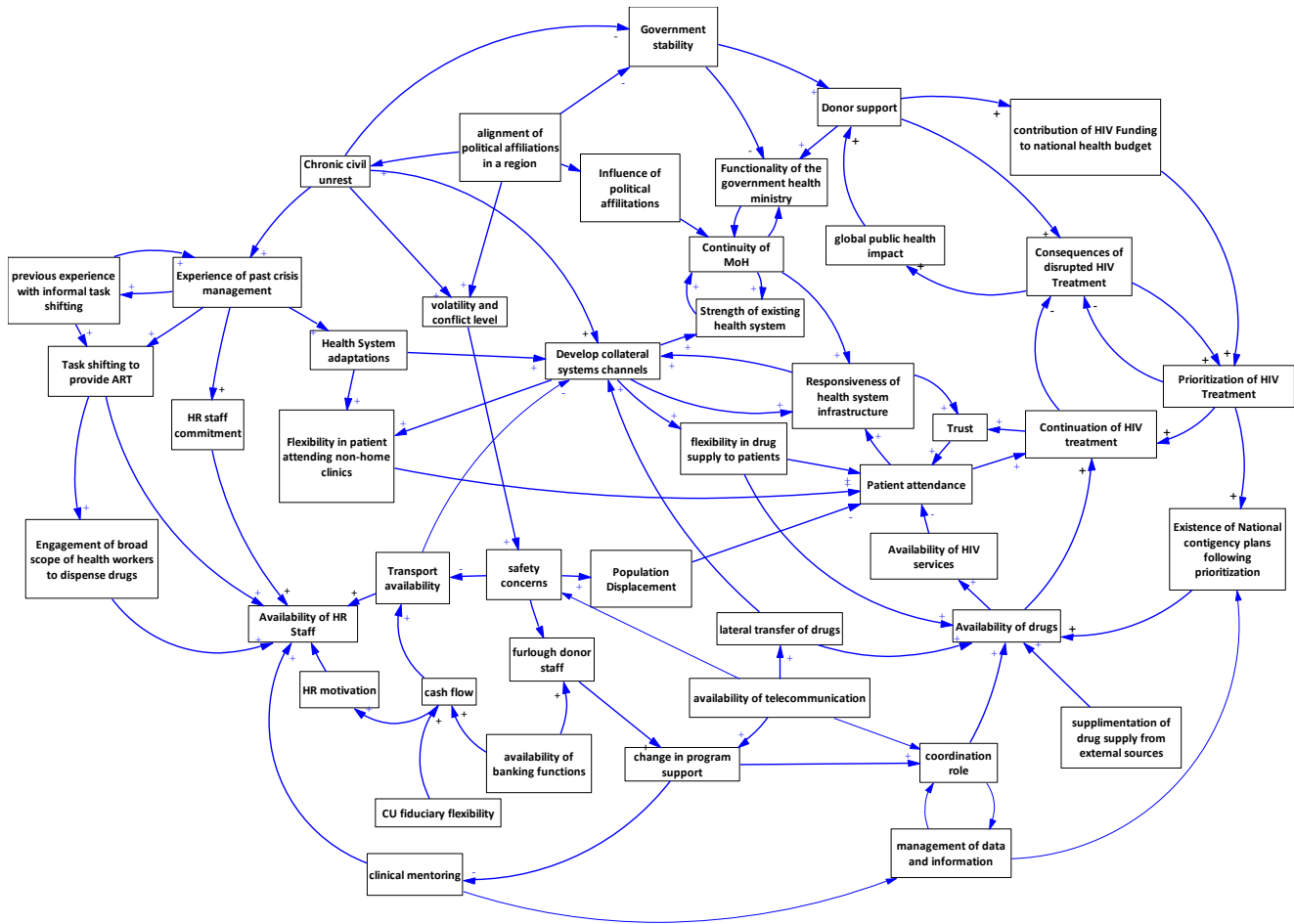
ICAP staff reported that initially they did not anticipate huge disruptions in the health system from the election aftermath. However they still prepared an emergency plan before the election was held as is usually the norm. The emergency plan included a 2-3 month ART supply to patients. As time went on, the crisis worsened and ICAP, in collaboration with the MOH and other stakeholders, decided to prioritize HIV treatment to avoid negative consequences of treatment disruption.

Interviews and the subsequent group model building discussion identified a wide range of issues that were seen to have supported the continuation of services - especially HIV treatment - in the period following the disputed election. Figure 1 shows the Preliminary Systems Model developed during the GMB session which highlighted what were considered by the group key drivers of the continuity of HIV treatment.

### Coordination mechanisms and task-shifting

At the beginning of the crisis, arrangements were put in place at various levels to manage and sustain the provision of HIV treatment to patients through the period of the crisis. At national level, the Ministry of Health, Centers for Disease Control (CDC), ICAP and other

<sup>5</sup> Vensim PLE. Ventana Software Inc. [www.vensim.com](http://www.vensim.com)



*Figure 1: Preliminary Systems Model of factors influencing continuation of service delivery*

implementing partners coordinated and developed strategies to ensure drug availability in the country. At the district level, there were pharmacists identified to coordinate drug distribution to the health facilities while at facility level task-shifting was employed by involving nurses and community health workers to renew prescriptions for the patients instead of relying on doctors.

### **Flexibility in drug supplies**

Further, there was flexibility in the disbursement of drugs to patients. For example, instead of the normal one month doses, patients were – as noted above – provided with 2-3 months drug supplies at the beginning of the crisis. This was later reduced to 10-20 days supplies as the crisis continued. There was flexibility across clinics to share drugs with those running short of stocks, with ICAP staff monitoring supplies and facilitating transfer

through regular cellphone contact. In some instances patients were given cards with information about their treatment regimen in case of displacement. Through such mechanisms, cellphone surveys by ICAP suggested that at least 80% of the health facilities maintained some ARV stocks through the crisis period.

### **Staff motivation and availability**

Tallies collected by ICAP staff through telephone calls with facilities indicated that staffing levels were generally maintained at high levels. For example, in the month of March 2011 – while transport was still severely disrupted and the banking system still closed<sup>6</sup> – staff absences were averaged below 10% across 17 affected districts. Such staffing levels were maintained despite non-payment of salaries to

<sup>6</sup>[http://www.unicef.org/infobycountry/cotedivoire\\_58393.html](http://www.unicef.org/infobycountry/cotedivoire_58393.html)

government supported health facility workers as a result of the banking shut down. Informants reported that due to experience in previous crises, health facility staff were generally confident that the government would pay them their salaries when the crisis was over.

### Service prioritization

In combination, the above factors enabled the majority of sites to continue to provide HIV treatment and care services. Monitoring telephone calls to facilities during the key months of the crisis (December 2010 to April 2011) suggested that over 95% of facilities were able to continue service provision. There were distinctive trends for different services over this period, however. ARV continuation was explicitly prioritized. Routine M&E data collected across all ICAP supported facilities indicates that the percentage of ART patients receiving ARVs uninterrupted for the previous six months actually increased during the crisis period (averaging over 40% through early 2011, and peaking at 47% between April and June 2011, compared to pre-crisis baseline of between 20% and 30%). The number of individuals who received HIV testing and counselling, however, showed a steady decline during the crisis period. Numbers being tested and counselled fell to 79% of pre-crisis baseline levels through January to March 2011, and to 52% of baseline levels through April to June 2011. These numbers recovered to 91% of baseline levels through July to September 2011, and exceeded baseline levels by October to December 2011. The number of women tested for HIV in ANC showed a similar pattern of decline during the crisis period, and subsequent rebound. Across supported districts, between 18,000 and 20,000 women were being tested each quarter in the pre-crisis period. This level was sustained in the early months of the crisis, but fell to 11,818 from April to June 2011. During the final quarter of that year, however, 21,545 women were tested for HIV in the context of ANC.

### External support

In addition to the commitment demonstrated by the in country health workers, external support was also viewed as having played a key role in ensuring the continuity of HIV services in the country. For example, the key informants reported that the UN supported in the procurement of drugs and brought them into the country when the MOH was not able to distribute the drugs from its central medical stores in Abidjan due to security challenges. Similarly, the US embassy assisted in providing security information to the in country team to ensure the safety of the health workers who needed to travel to the clinics.

### Summary Refined Systems Model

Based on reflections on these trends and interview data in the light of the GMB discussion, a refined systems model was developed (Figure 2). This systems model organizes factors and interrelationships in a manner reflecting more clearly the domains of concern identified by key informants and the most plausible direction of influence. A plus sign against an arrow indicates that a change (increase or decrease) in one variable is assumed to produce a similar change (increase or decrease) in the variable to which it was linked; a minus sign indicates an inverse relationship between the variables.

In this model seven domains were identified and clustered to visually show the main themes emanating from the discussion regarding key factors that affected the health system. These domains further attempt to define the various components in the complex dynamic system that affected the Cote D'Ivoire health system. The components include the *human resource dynamics* which was very crucial for the availability of health services just like the *maintenance of drug supplies and infrastructure* to ensure access to treatment. However, without patients using the services, the health systems could not register success hence the component of *patient access and utilization* of the services. Important during this crisis mode also, was the need for *prioritization of HIV treatment* over

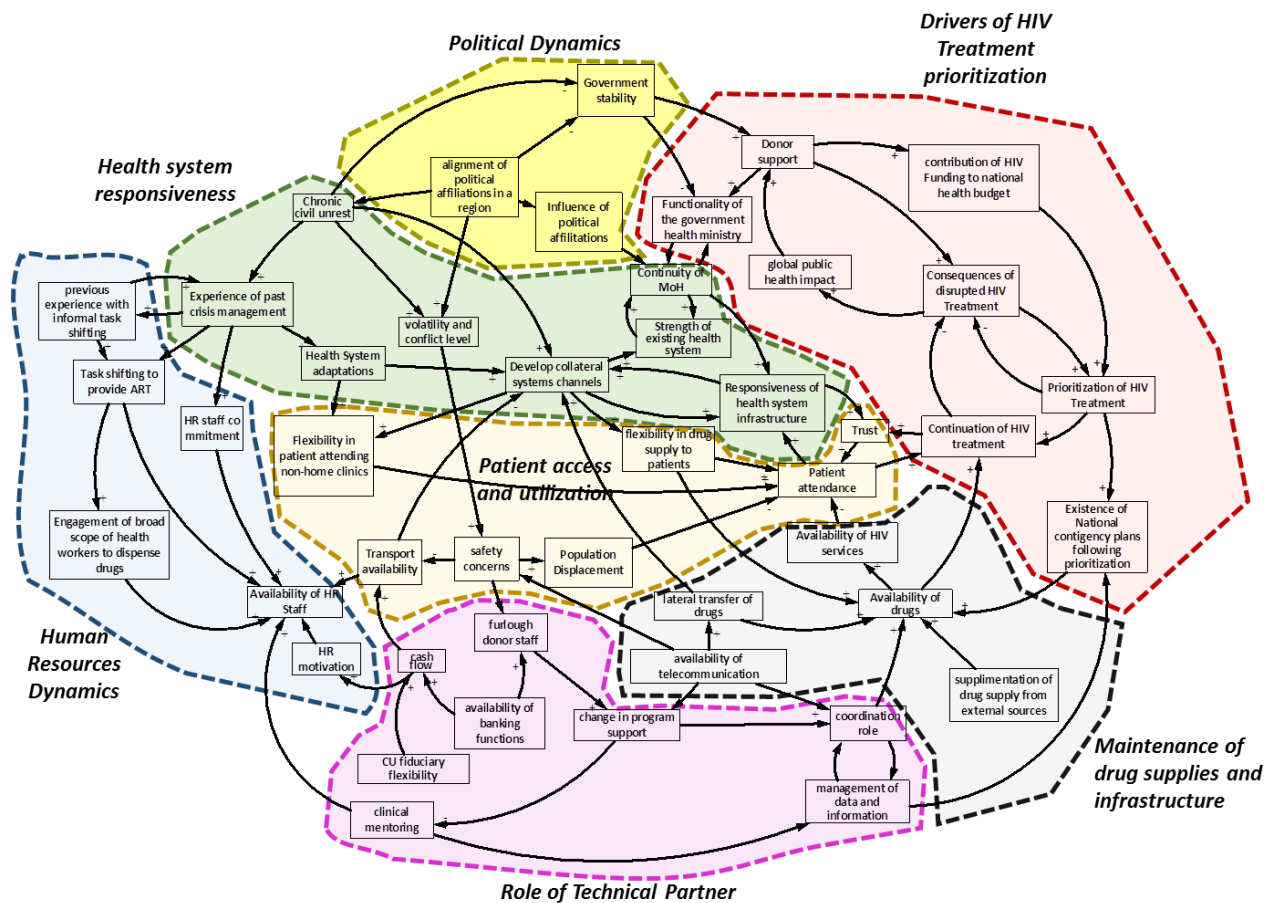


Figure 2: Refined Systems Model

other HIV services due to the perceived severe negative repercussions of treatment disruption. Another important factor included the *responsiveness of the health system*, which assisted in the continuation of HIV treatment as the system was able to adapt and continue to operate through the difficult times as it has been the case through the past crises. Finally *political dynamics* in the country and the *role of the technical partner* (ICAP), were found to be also contributing factors that affected the health system in the provision of HIV services.

Figure 3 provides an example of the sort of focused simulation model that can be developed through the extension of modeling with the Vensim systems software. Such simulation models are developed by focusing attention on a small cluster of the inter-relationships identified within the refined systems model, estimating values from

available data sources and modeling the influences on a key outcome (in this case, direct and lateral supply of drugs to clinics enabling patient access to ARVs). In this instance, there proved to be insufficient data available to fully develop the simulation, but it is shown here to provide an example of the potential for such modeling in future real-time case studies.

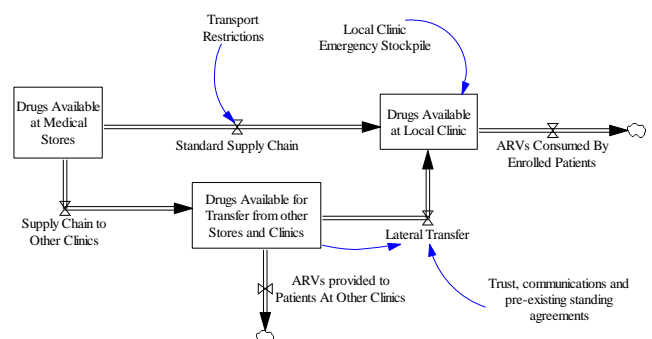


Figure 3: Example of Simulation Model

## IMPLICATIONS FOR MODELING HEALTH SYSTEMS RESILIENCE

This is a single case study informing a wider program of work seeking insight into means of modeling health systems resilience. The intention is to note across case studies patterns in the linkage of factors that appear to support or undermine resilience. In this first case study, however, three systemic features emerge as means to account for observed outcomes: available collateral pathways, narrowed focus of impact, and aligned motivational interests.

*Collateral pathways* refer to the availability of alternative routes to achieve a desired goal. There were many examples of this systems feature. For instance, in terms of drug availability, they were routed from one clinic to another using ICAP's communication system, non-physicians were allowed to facilitate prescriptions, and at the beginning of the crisis, drug supplies to patients were increased to about 3 months and later reduced to 10-20 days as the stocks diminished. Further, the key informants reported that at some point the drugs were sourced externally through the UN system. Finally, the health system was responsive and flexible enough to allow patients from other clinics to receive treatment in any clinic in case of displacement.

Similarly there were several ways to deal with cash flow challenges. For example, Columbia University (CU) supported ICAP in efforts to transport funds directly into the country to pay staff in Cote D'Ivoire through any possible manner including utilization of Western Union fund transfers within the country and later through Western Union offices in neighboring countries as Cote D'Ivoire Western Union had depleted its available cash. ICAP also decided to furlough some staff and only maintained a limited number of critical staff to run the programme due to the shortage of funds in country and to avoid legal ramifications.

There were two preconditions which appear to have generally enabled such collateral

pathways. One is the establishment of such routes, through innovation or exploiting previous connections. Examples include non-physician prescribing and CU funds coming to ICAP as cash or through Western Union. The former utilized a previously discussed strategy (but not implemented) towards nurse/community worker prescribing of ART, while the latter involved innovation. The second precondition was the trust required to utilize these pathways. Both of the examples above relied on high degrees of trust among individuals and stakeholders at different levels.

*Narrowing focus* was most clearly exemplified by the emerging agreement to focus efforts and resources on ARV continuation rather than new enrollment or voluntary Counseling and Testing (VCT). This was possible due to strong advocacy by ICAP and MOH for focus on patients already on HIV treatment. At the same time, others believed that it was equally important to continue to support other HIV-related services.

A third discernible systems feature was the influence of *aligned motivational interests*. This ranged from the motivation of health workers who attended work, often in the absence of pay - and in situations of some insecurity - for several weeks to the interests of the MOH, PEPFAR and CDC in ensuring that the clinical, financial and political implications of significant discontinuity of ARV treatment were avoided. In general, staff commitment at all levels was exemplary. ICAP in collaboration with MOH provided security information to the health workers on the ground and at times using their personal cellphone numbers as communication mechanisms. ICAP staff were also highly committed, even to the point of risking their safety, as they tried to support the clinics to ensure continuation of treatment was realized. Equally important was the commitment demonstrated by PEPFAR and CDC and other agencies of the U.S. government who provided every support throughout the crisis to ensure availability of drug supply and security information for staff safety.



## KEY POINTS

- The health system in Cote d'Ivoire displayed significant resilience in the context of the disruption following the disputed Presidential election of 2010
- Continuity of ART actually increased during the course of the crisis; coverage of other HIV services decreased during the crisis but later rebounded
- Several factors fostering such resilience were identified including co-ordination and task shifting, flexibility in drug supplies, staff motivation and availability, service prioritization and external support
- Systems modelling provided a mechanism to enable stakeholders to articulate a vivid picture of the interplay of key factors seen to influence response to the crisis
- The methodology developed for this *post hoc* analysis appears promising for planned real-time case studies of health systems resilience

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