

Effect of an armed conflict on human resources and health systems in Côte d'Ivoire: Prevention of and care for people with HIV/AIDS

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Abstract

In September 2002, an armed conflict erupted in Côte d'Ivoire which has since divided the country in the government-held south and the remaining territory controlled by the 'Forces Armées des Forces Nouvelles' (FAFN). There is concern that conflict-related population movements, breakdown of health systems and food insecurity could significantly increase the incidence of HIV infections and other sexually-transmitted infections, and hence jeopardize the country's ability to cope with the HIV/AIDS epidemic. Our objective was to assess and quantify the effect this conflict had on human resources and health systems that provide the backbone for prevention, treatment and care associated with HIV/AIDS. We obtained data through a questionnaire survey targeted at key informants in 24 urban settings in central, north and west Côte d'Ivoire and reviewed relevant Ministry of Health (MoH) records. We found significant reductions of health staff in the public and private sector along with a collapse of the health system and other public infrastructures, interruption of condom distribution and lack of antiretrovirals. On the other hand, there was a significant increase of non-governmental organizations (NGOs), some of which claim a partial involvement in the combat with HIV/AIDS. The analysis shows the need that these NGOs, in concert with regional and international organizations and United Nations agencies, carry forward HIV/AIDS prevention and care efforts, which ought to be continued through the post-conflict stage and then expanded to comprehensive preventive care, particularly antiretroviral treatment.

Introduction

As of the end of 2003, an estimated 38 million people globally were infected with HIV. Two-thirds of them are living in sub-Saharan Africa and, in many countries there HIV infection rates continue to grow (UNAIDS, 2004). In 2003 alone, an estimated 3 million people became newly infected with HIV in this part of the world (UNAIDS, 2004). In the same year, 2.9 million people died of AIDS and the estimated global burden of HIV/AIDS is 84.5 million disability adjusted life years (DALYs), which translates to 5.6% of the total global burden of disease (UNAIDS, 2004; WHO, 2004). More than 13 million children have been orphaned by AIDS and this figure could double by 2010 (UNICEF, 2002). In view of the rapid spread of HIV infections in other regions of the world, notably in East Asia and Eastern Europe, the HIV/AIDS epidemic will continue to have profound demographic, economic, governance and social implications for generations to come (Piot et al., 2001; de Waal, 2003; UNAIDS, 2004). The HIV/AIDS epidemic drains the social

and economic development of affected countries as a result of undermined household capacity and stability, reduced labour supply and productivity efficiency, shortage of critical skills and decline of institutional functioning (Mock et al., 2004; Wyss et al., 2004). Recent estimates suggest that the epidemic has reduced average growth rates across Africa by 2–4% annually over the past several years (Dixon et al., 2002).

The epidemiology of HIV/AIDS and other sexually-transmitted infections (STIs) is further complicated in settings where ethnic conflict, political violence and wars are rampant (Mock et al., 2004; Spiegel, 2004; UNAIDS, 2004). This issue is of growing significance because of the increasing number of armed conflicts throughout the world (Pedersen, 2002). More than 100 armed conflicts occurred in the 1990s, with the majority of them being intrastate conflicts (Fawole, 2004; Spiegel, 2004). They are particularly prevalent in Africa. Estimates for the year 2002 suggest that approximately half of the total number of deaths and DALYs

due to conflict occur in this part of the world (WHO, 2004). In 2003, more than 70 countries were identified as unstable, with many hundreds of millions of people directly or indirectly affected by conflicts (Spiegel, 2004; UNAIDS, 2004). As a direct consequence, an estimated 42 million people have been displaced globally, either fleeing across an international boarder (i.e. refugees and asylum seekers) or within a country (i.e. internally displaced people) (Thomas & Thomas, 2004; UNAIDS, 2004). Quantifying the health effects of an armed conflict, however, is a difficult task because collection of vital registration data normally ceases with the onset of a conflict (Murray et al., 2002). With regard to HIV/AIDS, it is thought that conflict-related population movements, augmented civil-military interactions, declined population health status (e.g. compromised immune system through nutritional deficiencies) and enhanced poverty render affected populations more vulnerable to HIV transmission (Bates et al., 2004; Ellman et al., 2005; Mock et al., 2004; Spiegel, 2004; UNAIDS, 2004).

However, it is not clear whether this enhanced vulnerability translates into more HIV-related illnesses (Connolly et al., 2004; Spiegel, 2004). New research from different settings shows that the relationship between conflict and the epidemiology of HIV/AIDS is a complex one, as it depends on local contextual determinants (Mock et al., 2004; Spiegel, 2004; UNAIDS, 2004).

On September 19, 2002, an armed conflict commenced in Côte d'Ivoire (Woods, 2003). Although it officially ended in July 2003, there continue to be periodic civil disturbances, such as the one that occurred in November 2004. As depicted in Figure 1, the division of the country in the government-held south and central, north and west Côte d'Ivoire held by troops of the FAFN persists despite efforts to reunite the country. Numerous reports set forth that public health staff and personnel from other sectors have either fled the FAFN-held zones or are no longer working. The health system and social services have collapsed. Hence, there is considerable concern that the country's

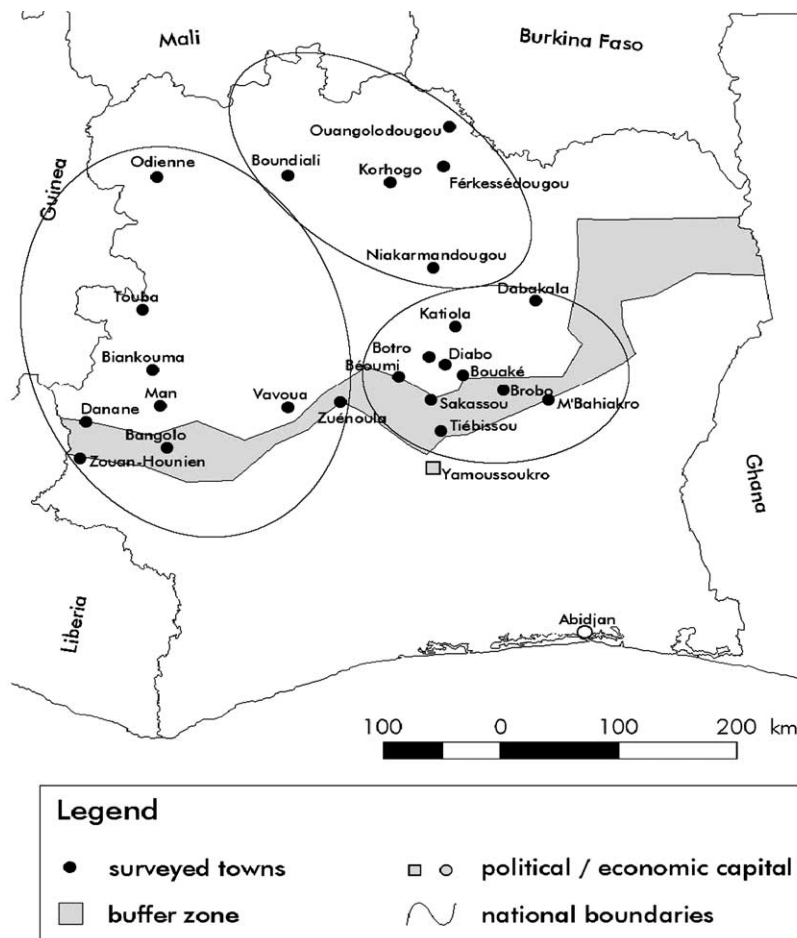


Figure 1. Map of Côte d'Ivoire showing the urban areas surveyed by key informant questionnaires in the FAFN-held areas of the country in the central, northern and western parts. The separation into the government-held south and the FAFN-controlled areas has no constitutional basis. The shaded area delineates the buffer zone. Source: <http://www.unhcr.org>.

ability to cope with the HIV/AIDS epidemic is compromised (<http://www.theglobalfund.org/en/>). Because Côte d'Ivoire has higher HIV infection rates than neighbouring countries, it is feared that if a refugee crisis emerged, this might increase HIV infection rates in the bordering countries (Connolly et al., 2004; Spiegel, 2004; UNAIDS, 2004). In addition, significant rates of HIV drug resistance to first-line treatment regimens have been reported in Côte d'Ivoire (Adjé et al., 2001; Toni et al., 2003).

The objective of the present study was to carry forward a rapid appraisal of how Côte d'Ivoire's armed conflict affected human resources and the functioning of health facilities, with particular consideration of the effects on prevention and care associated with HIV/AIDS. Our data sources include MoH records and a questionnaire survey administered to key informants in urban areas of FAFN-controlled zones. Our findings contribute to the broader discussion of the complex relationship between conflict and the epidemiology of HIV/AIDS and are of relevance for the development of policies and programmes to cope with the HIV/AIDS epidemic in the context of conflict-affected settings.

Methods

Approach and study area

A two-pronged approach was adapted to evaluate the effect of the 2002 armed conflict in Côte d'Ivoire with an emphasis on human resources and health systems. Particular consideration was given to coping mechanisms for the prevention of and care for people with HIV/AIDS.

Firstly, a multidisciplinary team was formed with various stakeholders who are active in the health sector. The group consisted of representatives from: (1) MoH; (2) Ministry of AIDS control; (3) Ivorian Agency for Social Marketing; (4) Centre Suisse de Recherches Scientifiques—a health research and development centre with a 50-year history in the country, based in Adiopodoumé, 17 km west of Abidjan; and (5) CARE International in Abidjan, an international NGO fighting global poverty, including activities targeted against HIV/AIDS. The latter is a recent recipient of a grant from the Global Fund to Fight AIDS, Tuberculosis and Malaria, for a project entitled 'Prevention of the spread of the HIV/AIDS epidemic in the context of severe political and military crisis' (<http://www.theglobalfund.org/en/>). Several meetings were held in the country's economic capital of Abidjan. Data on the number of health staff in the public and private sector, stratified by qualification and the number of existing and functioning health facilities, were compiled. Our

primary focus was on FAFN-controlled parts of the country. Data were assembled for 2001, shortly before commencement of the conflict, and for early 2004, 19 months after it began.

Secondly, a questionnaire survey aimed at different key informants was conducted in urban settings of the three main areas occupied by the troops of the FAFN (Figure 1). It included central Côte d'Ivoire (ten towns), the northern part of the country (five towns) and west Côte d'Ivoire (nine towns). The urban settings in each of the three study zones were selected according to their regional importance and accessibility. In addition, the general level of security and conditions of accommodation for our research team were taken into account so that staff would not be exposed to an excess risk of conflict-related violence.

Questionnaire survey

Four types of questionnaire (A–D) were employed. They were structured according to previously defined socio-professional layers of the different key informants.

Questionnaire A was addressed to politicians and military leaders in the selected towns. Information was sought on estimated adult (i.e. people aged ≥ 15 years) population displaced and the number of public and private establishments in the health sector operating before and after the outbreak of the conflict. Perceived impacts of the conflict on general living conditions and prevention and care associated with HIV/AIDS were also investigated. Questionnaire B aimed at quantification of health staff in the public and private sectors and presence of relevant NGOs. Questionnaire C was addressed to members from sectors and organizations that are active in the prevention of HIV/AIDS. Questions included, among others, whether HIV/AIDS awareness campaigns were conducted and what kind of prevention and care efforts were implemented (e.g. social marketing or free delivery of condoms). Questionnaire D was addressed to health staff in the public and private sectors, as well as to members of relevant NGOs. The interviewees were asked about the cumulative number of STIs, suspected HIV/AIDS cases, availability of diagnostic kits for STIs, essential drugs (particularly antiretrovirals) and commonly employed diagnostic algorithms. We were interested to obtain data for 2001 and the period between April 2003 and April 2004. In addition, a set of questions was included to gain information about current constraints to effectively preventing HIV infections (e.g. availability of condoms) and to caring for AIDS patients (e.g. access to antiretrovirals). This questionnaire therefore allowed cross-validation of MoH records.

Three teams of four people each carried out the interviews in the three study zones. Initially, all teams worked together in central Côte d'Ivoire. Following that, two teams lead the investigation in the west and the third team operated in the north. The questionnaire surveys were carried out in two weeks in late April and early May 2004.

Data management and analysis

Questionnaire responses were coded, entered, validated through a series of internal consistency checks and analysed using version 6.04 of the EpiInfo software (Centers for Disease Control and Prevention, Atlanta, USA).

Results

Operational results

The multidisciplinary team met six times for reviewing and analysing available MoH records and for identifying current data gaps that fed into the questionnaires. The interviews conducted by our field teams in the FAFN-held areas went smoothly. Overall, 165 questionnaires were administered, all of which were completed and used for the final analysis. In central Côte d'Ivoire, we administered 90 questionnaires (questionnaire A: *n* = 20, B: *n* = 23, C: *n* = 22, and D: *n* = 25); in the western part, we administered 45 questionnaires (A: *n* = 15, B: *n* = 6, C: *n* = 9, and D: *n* = 15); and in north Côte d'Ivoire we administered 30 questionnaires (A: *n* = 5, B: *n* = 5, C: *n* = 14, and D: *n* = 6).

An attempt is made throughout the following sections to present results in quantitative terms and to underscore some of the key issues with qualitative observations made during the interviews with the various key informants.

People displaced

Table I reveals that the total estimated adult population size in the three study areas was approximately

Table I. Estimated adult population sizes (aged 15 years and above) in the three study areas before and after the outbreak of Côte d'Ivoire's armed conflict in September 2002 and estimated fraction of the adult population displaced.

| Study area | Estimated adult population size in 2001 | Estimated % of adult population displaced ^a | Estimated adult population size in April/May 2004 |
|------------|---|--|---|
| Central | 802,325 | 40 | 481,395 |
| North | 552,686 | 25 | 414,515 |
| West | 1,075,731 | 55 | 484,079 |
| Total | 2,430,742 | | 1,379,989 |

^aEstimates are derived from interviews with the administrative authorities in the respective study areas.

2.4 million prior to the outbreak of Côte d'Ivoire's 2002 armed conflict. According to the administrative authorities, the estimated numbers of the adult population displaced as a result of the conflict were 25, 40 and 55% for the northern, central and western part of the country, respectively. Consequently, the estimated adult population size for the three study areas combined was reduced by approximately 1,050,000 people. Based on the most recent statistics from the United Nations, Côte d'Ivoire's population aged above 15 years accounts for 58.2% of the total population (UNDP, 2004). Employing this percentage, it follows that approximately 1,800,000 people left the FAFN-held areas. Other sources have estimated that the total number of internally displaced people and refugees were 750,000 and 500,000, respectively (Martone, 2003). Despite this difference, for subsequent analyses, we employed the estimates presented in Table I.

Effect of armed conflict on human resources and health systems

Table II shows the number of health staff in the public and private sectors in each of the three study areas as of 2001 and April/May 2004. Dramatic decreases in human resources occurred across all qualifications as a result of the armed conflict. The

Table II. Number of health staff by qualification in the public and private sectors in the three study areas before and after the outbreak of Côte d'Ivoire's armed conflict in September 2002. The number (%) of health staff who left as a consequence of the conflict is also given.

| Qualification | Number of health staff in central Côte d'Ivoire | | | Number of health staff in north Côte d'Ivoire | | | Number of health staff in west Côte d'Ivoire | | |
|-------------------------|---|----------------|---------------|---|----------------|---------------|--|----------------|---------------|
| | 2001 | April/May 2004 | Reduction (%) | 2001 | April/May 2004 | Reduction (%) | 2001 | April/May 2004 | Reduction (%) |
| Medical doctor | 127 | 3 | 124 (98) | 38 | 2 | 36 (95) | 69 | 6 | 63 (91) |
| Nurse | 471 | 67 | 404 (86) | 257 | 82 | 175 (68) | 310 | 42 | 268 (86) |
| Qualified midwife | 184 | 26 | 158 (86) | 65 | 9 | 56 (86) | 90 | 6 | 84 (93) |
| Nurses' aid | 42 | 6 | 36 (86) | 23 | 5 | 18 (78) | 10 | 1 | 9 (90) |
| Laboratory technologist | 88 | 12 | 76 (86) | 51 | 10 | 41 (80) | 54 | 7 | 47 (87) |
| Total | 912 | 114 | 798 (88) | 434 | 108 | 326 (75) | 533 | 62 | 471 (88) |

total number of health staff was reduced by three-quarters in north Côte d'Ivoire and even higher reductions of 88% were noted in central and west Côte d'Ivoire. The most pronounced loss of health staff was observed among the highest qualified personnel, namely medical doctors. Between 91% (west) and 98% (central) of the medical doctors left the FAFN-held territory and fled to the south or to other countries. In absolute figures, the 2001 statistics accounted for 127, 69 and 34 medical doctors in central, west and north Côte d'Ivoire, respectively. As of April/May 2004, the respective figures plummeted to just 3, 6 and 2, respectively. Not included in the latter figures are expatriate health personnel from relief organisations, notably Médecins sans Frontières (MsF) and the International Committee of the Red Cross (ICRS). These organizations were present in several of the surveyed towns, but their number of health staff was not readily available.

Very similar observations were made for the number of existing and functioning health facilities when comparing the situation in April/May 2004 with the period preceding the conflict. Table III shows the total number of health facilities that have been abandoned due to the conflict; 86 in central, 84 in north and 134 in west Côte d'Ivoire. These numbers translate to reductions of 72–80%. Prominent responses from health staff and political leaders were that health care delivery structures had been plundered or even destroyed, laboratory equipment and computers had been stolen and patient records and epidemiological monitoring and surveillance data had disappeared.

Table IV summarizes the frequency and percentage of selected indicators for appraisal of health systems' functioning, as captured by health staff interviews done in April/May 2004. These data show that on top of the large number of health facilities that disappeared, a high proportion of the few remaining ones lack essential drugs, including anti-retrovirals, and diagnostic kits for STIs. Very low compliance to diagnostic algorithms proposed by MoH were noted in north (11%) and central (29%)

Table III. Number of existing and functioning health facilities in the three study areas before and after the outbreak of Côte d'Ivoire's armed conflict in September 2002 and number (%) of health facilities abandoned.

| Study area | Number of existing and functioning health facilities | | Number (%) of health facilities abandoned |
|------------|--|----------------|---|
| | 2001 | April/May 2004 | |
| Central | 120 | 34 | 86 (72) |
| North | 111 | 27 | 84 (76) |
| West | 149 | 15 | 134 (90) |
| Total | 380 | 76 | 304 (80) |

Côte d'Ivoire. With regard to receipt of suspected cases of HIV/AIDS, health staff in only 27% of the health facilities visited in west Côte d'Ivoire responded positively, whereas the corresponding figures in the other parts of the country were 56–63%. Before the outbreak of the conflict, more than 90% of the health facilities in each study area had received suspected HIV/AIDS cases.

Effect of armed conflict on NGOs

In contrast to sharp declines in the number of human resources and health facilities, significant increases occurred in the number of NGOs that claimed to be actively engaged in the prevention of and care for people with HIV/AIDS. Table V shows that in April/May 2004, the total number of NGOs in the three study areas ($n=93$) had almost doubled when compared to the designated baseline in 2001 ($n=48$). While only a modest increase was observed in north Côte d'Ivoire (+19%), the number of NGOs in the western part of the country increased by more than 500% from 6 to 38. It is important to note that the NGOs identified in north and west Côte d'Ivoire are mainly local organizations and most of them lack the means and equipment to implement comprehensive activities for prevention of and care for people with HIV/AIDS, particularly treatment with antiretrovirals. A different picture was observed in the central part of the country, where several international NGOs were present. These international NGOs and some of the local NGOs pursued education and sensitising programmes for the prevention of and care for people with HIV/AIDS when our questionnaire survey was carried out.

Effect of armed conflict on prevention of and care for people with HIV/AIDS

Health staff and members of locally-active NGOs stressed that efforts for the prevention of and care for people with HIV/AIDS and other STIs were significantly reduced in the period after the outbreak of the conflict when compared to the period preceding it. Lack of equipment, diagnostic kits for STIs and essential drugs are prominent features of the post-conflict period. Human and financial resource constraints were articulated as major factors impeding the implementation of effective HIV/AIDS prevention activities since the beginning of the conflict.

Records obtained from the Ivorian Agency for Social Marketing revealed that the total number of condoms sold after the outbreak of the conflict was considerably lower when compared to the pre-conflict period (Table VI). After adjusting for the reduced adult population sizes due to conflict-

Table IV. Number (%) of health staff's affirmative responses on selected indicators for health facilities' functioning in the remaining health facilities for the three study areas in April/May 2004.

| Indicator | Number (%) of health facilities with affirmative responses | | |
|---------------------------------------|--|--------------|-------------|
| | Central (n=34) | North (n=27) | West (n=15) |
| Receipt of suspected HIV/AIDS cases | 19 (56) | 17 (63) | 4 (27) |
| Availability of kits for STIs | 13 (38) | 14 (52) | 9 (60) |
| Availability of essential drugs | 8 (24) | 16 (59) | 7 (47) |
| Availability of antiretrovirals | 11 (32) | 20 (74) | 9 (60) |
| Diagnosis according to MOH algorithms | 10 (29) | 3 (11) | 13 (87) |

induced displacements, marked reductions in the number of condoms sold per 1,000 adults per month were noted in two of the three study areas. Before the conflict, an estimated 157 and 120 condoms were sold per 1,000 adults per month in north and central Côte d'Ivoire, respectively. In the period after the outbreak of the conflict, the corresponding figures were 61 (-61%) and 91 (-24%), respectively. On the other hand, an increase of 40% was observed in the western part of the country: 43 condoms sold per 1,000 adults per month before the conflict versus 60 after it commenced. Care is needed in the interpretation of these data, because the records include only the most widely-distributed condom brand (i.e. through the PSI 'prudence' programme) and consequently sales of condoms through other wholesale channels and the informal sectors were not available, neither before nor after the outbreak of the conflict.

Table VII summarizes the total number of STIs and the number of cases per 1,000 adults for the three study areas for the designated baseline in 2001 and the one-year period lasting until April 2004. The data suggest that the numbers of STIs per 1,000 adults in the period after the conflict emerged were consistently higher than during the pre-conflict period. Whereas the observed increases in central (from 12 to 13.9 cases of STI per 1,000 adults; +16%) and north Côte d'Ivoire (from 4.9 to 6.6; +35%) were only modest, a 3.7-fold increase was observed in the western part of the country (from 11.4 to 41.8). As with the condom sales data presented before, care is needed in the interpretation

of these data due to a multiplicity of reasons. Nonetheless, our data support qualitative findings obtained from medical staff. For example, in west Côte d'Ivoire, the number of STIs rose sharply during the first months of the conflict.

Discussion

To our knowledge, this is the first scientific study that evaluates some of the effects the 2002 armed conflict of Côte d'Ivoire had on human resources in the public and private health sector and health facilities in urban settings of the FAFN-controlled territories. Particular emphasis has been placed on contextual and organizational issues to cope with the HIV/AIDS epidemic by comparing the pre-conflict situation to that 19 months after it began. An analysis of the root causes of this armed conflict has been presented recently (Woods, 2003). Here, we used both qualitative and quantitative methods and alternative data sources for triangulation of results. For example, the number of health staff by qualification was obtained from available MoH records, through key informant interviews done by our field teams and by visiting the remaining health facilities. This approach holds promise for minimizing potential sources of errors, which in turn enhances the validity of the findings (MacNeil & Hogle, 1998; Schopper et al., 2000).

An important operational result is that careful planning and vigilant conduct of interviews during a post-conflict period on territories still occupied by armed forces is feasible. The interviewees, including military authorities, were willing to respond to questions addressing human resources, functioning of health facilities and HIV/AIDS issues. Our observation that health-related research can be pursued in the aftermath of an armed conflict, which indeed facilitates assessment and quantification of conflict impacts, is consistent with recent reports from other conflict zones across Africa (Ahuka et al., 2004; DeLargy & Alakbarov, 2004; Larsen et al., 2004; O'Heir, 2004; Sodemann et al., 2004; Tangermann et al., 2000). Perhaps the most extreme example arises from the first nationwide cross-

Table V. Number of NGOs claiming active engagement in the prevention of and care for people with HIV/AIDS in the three study areas before and after the outbreak of Côte d'Ivoire's armed conflict in September 2002, including observed increases.

| Study area | Number of NGOs active in prevention of and care for people with HIV/AIDS | | |
|------------|--|----------------|--------------|
| | 2001 | April/May 2004 | Increase (%) |
| Central | 15 | 23 | 8 (53) |
| North | 27 | 32 | 5 (19) |
| West | 6 | 38 | 32 (533) |
| Total | 48 | 93 | 45 (94) |

Table VI. Total number of condoms sold per month and number of condoms used per month per 1,000 inhabitants in the three study areas before and after the outbreak of Côte d'Ivoire's armed conflict in September 2002.

| Study area | Baseline situation in 2001 | | Situation in the period between April 2003 and April 2004 | |
|------------|--|---|--|---|
| | Total number of condoms sold or distributed for free per month | Number of condoms used per 1,000 adults per month | Total number of condoms sold or distributed for free per month | Number of condoms used per 1,000 adults per month |
| Central | 96,200 | 120 | 43,803 | 91 |
| North | 86,700 | 157 | 25,433 | 61 |
| West | 45,818 | 43 | 28,862 | 60 |
| Average | 228,718 | 107 | 98,098 | 71 |

sectional survey carried out 18 months after the March 2003 invasion of Iraq. It shows that collection of public health data for armed conflict impact assessment is attainable even at a time of heightened insecurity and unprecedented levels of violence (Roberts et al., 2004). However, care is needed in the analysis and interpretation of data collected during conflicts, because there are inherent uncertainties attached to some of the data. The breakdown of health systems, for example, interrupts the continuous collection of primary public health data, thus impeding long-term surveillance and monitoring.

Our study indicates that there was a sudden and dramatic decline in the number of human resources and operating health facilities associated with the outbreak of Côte d'Ivoire's armed conflict. A comparison of the situation 19 months after the conflict began to that preceding it arrives at the conclusion that 75–88% of the health personnel left the FAFN-controlled areas and that 72–90% of the health facilities ceased their operation. The perceived climate of insecurity and violence in the FAFN-controlled areas and conflict-related destruction and plundering of the health facilities were important drivers of health staff displacement. Interestingly, the highest percentage of health staff leaving the FAFN-controlled areas was found among the best-qualified personnel, i.e. medical doctors. This might be explained by the country's policy to appoint highly-qualified people from the health and other sectors (e.g. education) irrespective of their home towns. It

is therefore conceivable that these government employees left at the onset of hostilities either to return to their relatives or to seek shelter in the government-held south or in other countries.

The significant displacement of health staff and the major breakdown of health facilities are of considerable concern. Firstly, a recent cross-country multiple regression analysis found that the density of human resources is an important factor in accounting for variation of maternal, infant and under-five mortality rates (Anand & Bärnighausen, 2004). These findings must be juxtaposed with miniscule ratios of health workers to population in Côte d'Ivoire even before the conflict emerged. Based on a recent international database set forth by the World Health Organization, the estimated numbers of physicians and nurses per 100,000 population in Côte d'Ivoire were as low as nine and 31, respectively, in the pre-conflict period (WHO, 2003). There are only few other countries with similarly tiny estimated ratios of health staff to population (Hongoro & McPake, 2004; WHO, 2003).

Secondly, ongoing research emphasises that strong health systems are mandatory for achieving universal coverage with critical health interventions, such as the prevention of and care for people with HIV/AIDS (Victora et al., 2004). Hence, the deterioration of provision of basic preventive and curative delivery of health services, including prevention and care of HIV/AIDS, is jeopardized. Support for this claim is derived from the markedly reduced number of condoms sold per 1,000 adults per month in two

Table VII. Total number of cases of STIs recorded by health staff and NGOs in each of the three study areas in 2001 and in the period between April 2003 and April 2004. Respective numbers of cases per 1,000 adults are also given.

| Study area | Baseline situation in 2001 | | Situation in the period between April 2003 and April 2004 | |
|------------|-----------------------------------|---------------------------------|---|---------------------------------|
| | Total number of STIs ^a | Number of STIs per 1,000 adults | Total number of STIs ^a | Number of STIs per 1,000 adults |
| Central | 9,629 | 12 | 6,708 | 13.9 |
| North | 2,697 | 4.9 | 2,748 | 6.6 |
| West | 12,310 | 11.4 | 20,232 | 41.8 |
| Total | 24,636 | 10.1 | 29,688 | 21.5 |

^aFigures are the cumulative number of cases of STIs recorded at the existing health facilities and by NGOs in the urban settings visited during the questionnaire surveys.

of the three settings. However, great care is needed in the interpretation of these data, particularly in view of wide margins around the estimated population size displaced and potentially different distribution channels before and after the outbreak of the conflict. Our interviews revealed that approximately 1.8 million people were displaced, while another source set forth 1.25 million (Martone, 2003). Current estimates are even lower (<http://www.unhcr.org>). Condoms from neighbouring Burkina Faso and Mali were observed in local markets in the occupied territories of Côte d'Ivoire. Clearly, the difference between the estimates of people displaced and the under-reporting of condoms other than those distributed through the national PSI programme influences the number of condoms sold per 1,000 adults.

A lack of awareness campaigns was particularly noted in north and west Côte d'Ivoire, which in turn is likely to negatively affect sex-related knowledge, attitudes and practice of young adults. Sexual activity commences at an early age; hence particular emphasis should be placed on the age group of 15–24 years, especially teenage girls and young women. There is concern that this group is particularly vulnerable to HIV transmission in a conflict setting, as transactional and commercial sex may become a strategy for survival (Bates et al., 2004; Hankins et al., 2002; Mock et al., 2004; Spiegel, 2004; UN-AIDS, 2004; Watts & Zimmerman, 2002).

The negative impact of Côte d'Ivoire's armed conflict on human resources and health facilities provides a legitimate concern that this constellation can fuel the HIV/AIDS epidemic. For example, interruption of existing antiretroviral therapy programmes could present a significant potential for development and spread of resistant HIV strains, which have already been documented in south Côte d'Ivoire (Adjé et al., 2001; Toni et al., 2003). Emergence of a large-scale refugee population in surrounding countries with lower HIV prevalence rates (Spiegel, 2004; UNAIDS, 2004) and, probably, lower HIV resistance profiles could result in unintended mixing of these populations and subsequent transformation of the rate and shape of the HIV/AIDS epidemic curve (Krieger et al., 2004). However, we noted that the number of NGOs that claim active engagement in the prevention of and care for people with HIV/AIDS after the outbreak of the conflict was almost twice the pre-conflict number. This might be explained by the prompt arrival of several international organisations and UN agencies shortly after the outbreak began. These organisations usually team up with local counterparts, often drawn from NGOs, to carry forward their emergency activities. The importance of collaborative efforts between governments, UN agencies, national and

international organisations and NGOs and a more strategic positioning of UN agencies and NGOs has been stressed before (O'Heir, 2004; Salama et al., 2004). A recent study carried out in Guinea-Bissau, for example, documented a decline in case fatality among hospitalised children during an armed conflict, which had been explained by a strengthened health system, including improved access to effective care and treatment (Sodemann et al., 2004). Another study carried out in Sierra Leone that focused on military personnel and commercial sex workers, showed that sound HIV/AIDS awareness campaigns during post-conflict periods can significantly reduce the transmission of HIV (Larsen et al., 2004). Declines in HIV prevalence rates have been reported recently from different parts of the Democratic Republic of Congo. Underlying reasons might be the overall decrease in social life and changes in sexual risk behaviour partially explained by reduced accessibility to sexual partners and reduced mobility (Mulanga et al., 2004). Consequently, although an armed conflict is likely to enhance the vulnerability to HIV/AIDS, this does not necessarily translate into more intense transmission, as the relationship between conflict and the HIV/AIDS epidemic is governed by an array of locally-specific contextual determinants (Mock et al., 2004; Spiegel, 2004).

We conclude that the 2002 armed conflict in Côte d'Ivoire had major negative effects on human resources and the health system in general and the prevention of and care for people with HIV/AIDS in particular. The available data suggest that the condom distribution system has been interrupted and that the number of STIs has increased considerably. These data, however, must be interpreted with great care, as they are inevitably subject to potential confounding factors, including a denominator problem of total population, number of condoms used that entered via new channels and, perhaps, more accurate reporting of STIs by experienced personal from some of the NGOs and international relief organisations. In view of efforts already being made by NGOs, international organisations and UN agencies to cope with the HIV/AIDS epidemic, it will be of pivotal importance that these emergency activities are carried through the post-conflict period. In parallel, health facilities must be rehabilitated, both structurally and functionally, so that they can provide the backbone of prevention of and care for people with HIV/AIDS, particularly antiretroviral treatment and other STIs in the longer term.

Acknowledgements

We thank the MoH and the Ministry of AIDS Control for their collaboration and sharing of

relevant documents. We are grateful to the various key informants for their time and willingness in responding to our questionnaires, including political and military leaders, public and private health staff and representatives from international and local NGOs engaged in prevention of and care for people with HIV/AIDS. Thanks are also addressed to colleagues from the Centre Suisse de Recherches Scientifiques for administrative support and Dr Gary R. Krieger and an anonymous reviewer for valuable comments on the manuscript.

This investigation received financial support from the Global Fund to Fight AIDS, Tuberculosis and Malaria for the project, entitled 'Prevention of the spread of the HIV/AIDS epidemic in the context of severe political and military crisis'. At the time this investigation was carried out, B. G. Koudou, G. Cissé and M. Tanner were partially supported by the National Centre of Competence in Research (NCCR) North-South, 'Research Partnerships for Mitigating Syndromes of Global Change' and Individual Project #4 (IP4) entitled 'Health and well-being', which is financed through the Swiss National Science Foundation (SNF). J. Utzinger is a recipient of an 'SNF-Förderungsprofessur' (Project No. PPOOB-102883).

References

- Adje, C., Cheingsong, R., Roels, T.H., Maurice, C., Djomand, G., Verbiest, W., et al. (2001). High prevalence of genotypic and phenotypic HIV-1 drug-resistant strains among patients receiving antiretroviral therapy in Abidjan, Côte d'Ivoire. *Journal of Acquired Immune Deficiency Syndrome*, 26, 501–506.
- Ahuka, O.L., Chabikuli, N., & Ogunbanjo, G.A. (2004). The effects of armed conflict on pregnancy outcomes in the Congo. *International Journal of Gynaecology and Obstetrics*, 84, 91–92.
- Anand, S., & Bärnighausen, T. (2004). Human resources and health outcomes: Cross-country economic study. *Lancet*, 364, 1603–1609.
- Bates, I., Fenton, C., Gruber, J., Lalloo, D., Lara, A.M., Squire, S.B., et al. (2004). Vulnerability to malaria, tuberculosis and HIV/AIDS infection and disease. Part II: Determinants operating at environmental and institutional level. *Lancet Infectious Diseases*, 4, 368–375.
- Connolly, M.A., Gayer, M., Ryan, M.J., Salama, P., Spiegel, P., & Heymann, D.L. (2004). Communicable diseases in complex emergencies: Impact and challenges. *Lancet*, 364, 1974–1983.
- de Waal, A. (2003). How will HIV/AIDS transform African governance? *African Affairs*, 102, 1–23.
- DeLargy, P., & Alakbarov, R. (2004). Thinking ahead about reproductive health: Contingency planning and emergency preparedness in crisis situations (Iraq and West Africa). *Disasters*, 28, 340–350.
- Dixon, S., McDonald, S., & Roberts, J. (2002). The impact of HIV and AIDS on Africa's economic development. *British Medical Journal*, 324, 232–234.
- Ellman, T., Culbert, H., & Torres-Feced, V. (2005). Treatment of AIDS in conflict-affected settings: A failure of imagination. *Lancet*, 365, 278–280.
- Fawole, W.A. (2004). A continent in crisis: Internal conflicts and external interventions in Africa. *African Affairs*, 103, 297–303.
- Hankins, C.A., Friedman, S.R., Zafar, T., & Strathdee, S.A. (2002). Transmission and prevention of HIV and sexually transmitted infections in war settings: Implications for current and future armed conflicts. *AIDS*, 16, 2245–2252.
- Hongoro, C., & McPake, B. (2004). How to bridge the gap in human resources for health. *Lancet*, 364, 1451–1456.
- Krieger, G.R., Magnus, M., & Hassig, S.E. (2004). HIV/AIDS prevention programs: Methodologies and insights from the dynamic modeling literature. *Clinics in Occupational and Environmental Medicine*, 4, 45–69.
- Larsen, M.M., Sartie, M.T., Musa, T., Casey, S.E., Tommy, J., & Saldinger, M. (2004). Changes in HIV/AIDS/STI knowledge, attitudes and practices among commercial sex workers and military forces in Port Loko, Sierra Leone. *Disasters*, 28, 239–254.
- MacNeil, J.M., & Hogle, J. (1998). Applying social, behavioral and evaluation research to developing country HIV prevention programs. *AIDS*, 12 (Suppl. 2), S99–S108.
- Martone, G. (2003). The crisis in West Africa. *American Journal of Nursing*, 103, 32–40.
- Mock, N.B., Duale, S., Brown, L.F., Mathys, E., O'Maonaigh, H.C., Abul-Husn, N.K.L., et al. (2004). Conflict and HIV: A framework for risk assessment to prevent HIV in conflict-affected settings in Africa. *Emerging Themes in Epidemiology*, 1, 6.
- Mulanga, C., Bazepeo, S.E., Mwamba, J.K., Butel, C., Tshimpaka, J.W., Kashi, M., et al. (2004). Political and socio-economic instability: How does it affect HIV? A case study in the Democratic Republic of Congo. *AIDS*, 18, 832–834.
- Murray, C.J.L., King, G., Lopez, A.D., Tomijima, N., & Krug, E.G. (2002). Armed conflict as a public health problem. *British Medical Journal*, 324, 346–349.
- O'Heir, J. (2004). Pregnancy and childbirth care following conflict and displacement: Care for refugee women in low-resource settings. *Journal of Midwifery and Women's Health*, 49 (Suppl. 1), S14–S18.
- Pedersen, D. (2002). Political violence, ethnic conflict and contemporary wars: Broad implications for health and social well-being. *Social Science and Medicine*, 55, 175–190.
- Piot, P., Bartos, M., Ghys, P.D., Walker, N., & Schwartländer, B. (2001). The global impact of HIV/AIDS. *Nature*, 410, 968–973.
- Roberts, L., Lafta, R., Garfield, R., Khudhairi, J., & Burnham, G. (2004). Mortality before and after the 2003 invasion of Iraq: Cluster sample survey. *Lancet*, 364, 1857–1864.
- Salama, P., Spiegel, P., Talley, L., & Waldman, R. (2004). Lessons learned from complex emergencies over the past decade. *Lancet*, 364, 1801–1813.
- Schopper, D., Torres, A.M., Pereira, J., Ammon, C., Cuende, N., Alonso, M., et al. (2000). Setting health priorities in a Swiss canton: What do different methods tell us? *Journal of Epidemiology and Community Health*, 54, 388–393.
- Sodemann, M., Veirum, J., Biai, S., Nielsen, J., Bale, C., Skytte Jakobsen, M., et al. (2004). Reduced case fatality among hospitalized children during a war in Guinea-Bissau: A lesson in equity. *Acta Paediatrica*, 93, 959–964.
- Spiegel, P.B. (2004). HIV/AIDS among conflict-affected and displaced populations: Dispelling myths and taking action. *Disasters*, 28, 322–339.
- Tangermann, R.H., Hull, H.F., Jafari, H., Nkowane, B., Everts, H., & Aylward, R.B. (2000). Eradication of poliomyelitis in countries affected by conflict. *Bulletin of the World Health Organization*, 78, 330–338.
- Thomas, S.L., & Thomas, S.D.M. (2004). Displacement and health. *British Medical Bulletin*, 69, 115–127.
- Toni, T.D., Recordon-Pinson, P., Minga, A., Ekouevi, D., Bonard, D., Bequet, L., et al. (2003). Presence of key drug resistance mutations in isolates from untreated patients of Abidjan, Côte

- d'Ivoire: ANRS 1257 study. *AIDS Research and Human Retroviruses*, 19, 713–717.
- UNAIDS (2004). *2004 report on the global AIDS epidemic*. Geneva: Joint United Nations Programme on HIV/AIDS.
- UNDP (2004). *Human development report 2004: Cultural liberty in today's diverse world*. New York: United Nations Development Programme.
- UNICEF (2002). *Children on the brink 2002: A joint report on orphan estimates and program strategies*. New York: United Nations Children's Fund.
- Victoria, C.G., Hanson, K., Bryce, J., & Vaughan, J.P. (2004). Achieving universal coverage with health interventions. *Lancet*, 364, 1541–1548.
- Watts, C., & Zimmerman, C. (2002). Violence against women: Global scope and magnitude. *Lancet*, 359, 1232–1237.
- WHO (2003). *Global atlas of the health workforce*. Geneva: World Health Organization. Available at: <http://www.who.int/GlobalAtlas/home.asp>
- WHO (2004). *The world health report 2004—changing history*. Geneva: World Health Organization.
- Woods, D. (2003). The tragedy of the cocoa pod: Rent-seeking, land and ethnic conflict in Ivory Coast. *Journal of Modern African Studies*, 41, 641–655.
- Wyss, K., Hutton, G., & N'Diekhon, Y. (2004). Costs attributable to AIDS at household level in Chad. *AIDS Care*, 16, 808–816.