Strategies to improve immunization services in urban Africa

F.T. Cutts

The urban poor constitute a rapidly increasing proportion of the population in developing countries. Focusing attention on underserved urban slums and squatter settlements will contribute greatly to immunization programme goals, because these areas account for 30–50% of urban populations, usually provide low access to health services, carry a large burden of disease mortality, and act as sources of infection for the city and surrounding rural areas.

Improvement of urban immunization programmes requires intersectoral collaboration, use of all opportunities to vaccinate eligible children and mothers, identification of low-coverage neighbourhoods and execution of extra activities in these neighbourhoods, and community mobilization to identify and refer persons for vaccination. Improved disease surveillance helps to identify high-risk populations and document programme impact. New developments in vaccines, such as the high-dose Edmonston–Zagreb vaccine, will allow changes in the immunization schedule that facilitate the control of specific diseases. Finally, operational research can assist managers to conduct urban situation assessments, evaluate programme performance at the “micro” level, and design and monitor interventions.

Introduction

By the year 2000 half the world’s population is expected to live in urban areas. Although less urbanized than Asia and Latin America, sub-Saharan Africa is projected to have the largest rate of urban population increase over the period 1975–2000. Urban population growth in Africa averaged more than 5% per year in the 1970s, with that of Lagos increasing at 14% per year and of Maputo at 8% per year (1, 2).

Compared with rural areas, cities offer many advantages for the delivery of immunization services: the high population density provides the potential for cost-effective services; the relative abundance of health facilities and personnel, smaller distances, and greater ease of communication facilitate logistics and programme supervision; and the higher school enrolment and level of education of the population facilitate information dissemination. However, these characteristics are not uniform throughout urban areas. The poor, who represent 30–60% of the urban population in Africa, have special problems that warrant the development of strategies designed specifically for them (1–3). In 1989 the Global Advisory Group of the Expanded Programme on Immunization (EPI) recommended that national and municipal programme managers develop action plans to reach urban populations. This article outlines the major problems documented by operational research studies in Africa, and discusses potential strategies to improve urban immunization services.

Urban characteristics that inhibit programme success

Urban immunization services face problems caused by the following: the epidemiology of target diseases in high-density populations; consumer characteristics that restrict the use of services; and features of the health services and providers that reduce the effectiveness of services. While these problems are not all specific to urban areas, they have greater importance because of the high mortality from measles among the urban poor.

Target disease epidemiology

Urban areas deserve priority for immunization programmes because disease transmission is perpetuated by the high birth rate, crowded living conditions, and continuous influx of new susceptibles from rural areas. The high density of susceptibles means that a higher immunization coverage than in rural areas must be achieved to control transmission of diseases spread by personal contact, particularly measles. Endemic urban areas seed measles infection to rural areas, suggesting that improved disease control in the former areas will
also benefit the latter (4, 5). The high density of susceptible children leads to early transmission of the disease, with consequent high case fatality. In Kinshasa, Zaire, approximately one-third of reported measles cases involve under-9-month-olds (Table 1) (6). Young children have higher case fatality rates from measles (Table 2). The case fatality from measles is also greater in urban areas because crowding leads to intensive exposure (7). Severely malnourished children are more common in low-income urban families than in rural populations, because rural families often have a small piece of land on which to grow some of their food (2). The high prevalence of malnutrition in urban slums may increase the case fatality (8). Reduction of the incidence of measles will therefore have a greater impact on mortality from the disease in urban than in rural areas.

**Competing priorities**

Families that have a marginal existence have little time to devote to child care. In Conakry, Guinea, a knowledge, attitudes and practice (KAP) survey found that among lower socioeconomic groups the children of mothers who worked outside the home (mainly in markets or as street vendors) had lower immunization uptake than those whose mothers were not employed. Mothers who had been turned away from vaccination sessions or asked to return on another day, were also less likely to complete the immunization series (9). Long waiting times at health centres have been associated with failure to complete the immunization series in Conakry (9) and Lagos (10).

**Consumer characteristics**

In Africa urban populations are culturally, socioeconomically and linguistically heterogeneous, transient, and mobile (7). Compared with rural areas, community leaders in urban areas may be more difficult to identify, have less time to devote to voluntary services, and have less widespread influence on community behaviour. Also, the competing priorities and high migration rates of urban families tend to reduce the use of health services.

Table 1: Age distribution of reported measles cases, Kinshasa, 1981–89

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>0–8</td>
<td>27</td>
<td>27</td>
<td>28</td>
<td>31</td>
<td>33</td>
<td>33</td>
<td>30</td>
</tr>
<tr>
<td>9–23</td>
<td>38</td>
<td>42</td>
<td>43</td>
<td>41</td>
<td>37</td>
<td>36</td>
<td>42</td>
</tr>
<tr>
<td>≥24</td>
<td>35</td>
<td>30</td>
<td>28</td>
<td>28</td>
<td>30</td>
<td>31</td>
<td>28</td>
</tr>
</tbody>
</table>

* Data were not available for these age categories in 1984–85.

Table 2: Reported age-specific case-fatality rates for measles, Kinshasa, 1981–1983

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>No. of cases</th>
<th>No. of deaths</th>
<th>Case fatality rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–11</td>
<td>9290</td>
<td>832</td>
<td>8.9</td>
</tr>
<tr>
<td>12–23</td>
<td>4850</td>
<td>514</td>
<td>10.6</td>
</tr>
<tr>
<td>24–35</td>
<td>3054</td>
<td>363</td>
<td>11.9</td>
</tr>
<tr>
<td>≥36</td>
<td>2996</td>
<td>96</td>
<td>3.2</td>
</tr>
</tbody>
</table>

**Health service characteristics**

**Health service infrastructures**

Many countries inherited clinically oriented health services that are concentrated in middle-class and business districts of cities. Large hospitals may be inappropriately used as the first source of care. In Conakry, 36% of child caretakers interviewed in a community survey cited the two large tertiary hospitals as their usual source of child care (14). Municipal and national governments lack resources and sometimes the political will to build new facilities in rapidly growing areas, and pockets of low coverage occur.

The private sector provides a variable proportion of health care in urban areas of Africa. Primary health care may be a low priority for private practitioners, since profits from care of the acutely ill and for dispensing medications are higher. Separation of curative care in the private sector from preventive care in the public sector means that families have to make special visits to health centres to obtain vaccinations. In Conakry, competition
from private pharmacies made it difficult to establish the essential drugs programme that was used in rural areas of Guinea to attract families to health centres.

**Pockets of low vaccination coverage**

High vaccination coverage citywide may conceal pockets of low coverage that act as foci for continuing transmission of target diseases. For example, in Kinshasa some pockets of low coverage have been identified in areas where the health service infrastructure is poor. Also in Yaoundé, areas with low coverage, compared with high-coverage neighbourhoods, had a larger proportion of persons of a particular ethnic group and a larger proportion of recent migrants (11).

**Missed immunization opportunities**

In Mozambique, a KAP survey in Inhambane city showed that children whose nearest health centre vaccinated only once per week had a relative risk of 8.5 for incomplete vaccination compared with children whose nearest health centre vaccinated on three or more days per week, after controlling for socioeconomic and other risk factors (13).

A study of 11 health facilities in Khartoum showed that opportunities to administer at least one antigen were missed for 58% of infants of 236 mothers who had brought their children to a facility for a reason other than immunization (15). A total of 29% of children had never been immunized, which illustrates the potential importance of using visits for curative care to immunize “hard-to-reach” children.

The results of a community survey in Conakry illustrate the magnitude of the effect of missed opportunities on reducing coverage. The dates of vaccinations and of health centre visits for curative care were obtained from home-based records during a cluster sample survey (9). Of 204 children with vaccination cards, 72 (35%) were fully immunized, while an additional 28% would have been so had all vaccines been given at the appropriate times and all contacts been used to vaccinate (Table 3).

**Nosocomial transmission of measles**

Because measles is endemic in most large African cities, failure to vaccinate eligible children who attend urban health centres increases the risk of its nosocomial transmission. In a case–control study of children who were attending a major health centre in Abidjan, Côte d’Ivoire, at the end of a measles epidemic, Klein-Zaaban et al. estimated that two-thirds of cases had acquired their infection at the centre (16).

**Low health worker motivation**

In urban areas health worker motivation is often low because of the high cost of living, poor remuneration, and lack of identification with the community. In Conakry, key informant interviews with vaccinators and health centre chiefs showed that there were minimal lines of communication between health workers and the community (17). Health workers may attempt to supplement income by making unofficial charges for immunization, or give priority to curative services for which they can charge for treatment. In focus group studies in Conakry, mothers complained that charges were made for vaccination, despite publicity stating that it was free (17). There is a high drop-out rate among urban community health workers because of the low pay. Also, the dependence of the urban population on sophisticated, curative health services makes it difficult for community health workers to gain credibility (2).

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**Table 3: Potential coverage predicted for children with vaccination records, Conakry, 1989**

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>At correct age</th>
<th>Too early</th>
<th>No. of missed opportunities</th>
<th>Potential coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>VACCINE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BCG</td>
<td>188 (92)</td>
<td>0 (0)</td>
<td>16 (8)</td>
<td>204 (100)</td>
</tr>
<tr>
<td>DPT/OPV 1</td>
<td>171 (84)</td>
<td>10 (5)</td>
<td>13 (6)</td>
<td>194 (95)</td>
</tr>
<tr>
<td>DPT/OPV 2</td>
<td>140 (69)</td>
<td>9 (4)</td>
<td>23 (11)</td>
<td>172 (84)</td>
</tr>
<tr>
<td>DPT/OPV 3</td>
<td>103 (50)</td>
<td>3 (1)</td>
<td>36 (18)</td>
<td>142 (70)</td>
</tr>
<tr>
<td>Measles</td>
<td>106 (50)</td>
<td>17 (8)</td>
<td>30 (15)</td>
<td>153 (75)</td>
</tr>
<tr>
<td>Complete</td>
<td>72 (35)</td>
<td>19 (9)</td>
<td>39 (19)</td>
<td>130 (64)</td>
</tr>
</tbody>
</table>

* Calculated assuming that the vaccines were administered to children at the appropriate age, and all health centre contacts were used to vaccinate.

* DPT = diphtheria–pertussis–tetanus; OPV = oral poliomyelitis vaccine.

* Figures in parentheses are percentages.
Potential strategies for urban immunization programmes

Specific action for urban areas

Specific plans of action should be made for large urban areas, with set targets and separate monitoring from that in rural areas. Ideally, this would follow an urban assessment or review of the existing health delivery situation. Guidelines for such assessments have been provided by the Resources for Child Health project (18).

Intersectoral collaboration

Immunization personnel acting alone are unlikely to be able to resolve the multifaceted problems encountered in urban programmes and multi-sectoral committees should therefore be formed to plan and coordinate the activities. In Mozambique, for example, city and provincial health departments have worked together with political leaders to establish city health committees, inviting representatives from other government services, the political party, and the community (Table 4). In the larger cities, visits from senior Ministry of Health and donor agency officials have further stimulated formation of committees. Each participant in the committee should have clearly defined roles.

Improving existing services

Full use should be made of existing health facilities, by vaccinating each day in centres that serve densely populated areas, and using all contacts with eligible children and mothers to immunize. Systematic vaccination of eligible children, including those who are sick, will reduce nosocomial transmission of measles at the same time as increasing coverage (19, 20).

Health worker training needs can be evaluated using “facility assessments”, which include observation of immunization practices and logistics, and interviews with mothers and health workers. Such assessments can identify service delivery problems and evaluate improvements after training and supervision (21). Health-workers’ motivation can be increased by involving them in evaluations and providing them with verbal and written feedback (22, 23).

In Lagos improved clinic procedures led to a 24% increase in monthly vaccinations performed, at no cost increase (10). To reduce waiting times, an immunization station was set up where patients could go directly from reception, instead of requiring a prior consultation and physical examination. The compliance of nurses with the policy of vaccinating sick children was monitored by reviewing immunization record cards at the exit.

Identifying and reaching low-coverage neighbourhoods

Pockets of low coverage should be located, for example, by using routine data on immunization activities, if denominator populations are available for the catchment areas of different health centres and there is little cross-boundary flow. A possible alternative, which requires further validation, is to conduct community surveys using the lot quality assurance sample (LQAS) method in each neighbourhood of interest. This method has previously been used to review clinic records (24), and was piloted at the community level in Kinshasa in 1988. A sample of 14 children was selected in each zone by randomly marking 14 points on a map, finding the corresponding street location, and proceeding house-to-house until a child aged 12–23 months was registered. Zones with >4/14 children who were unvaccinated for measles were classified as having a low coverage (24). The results agreed with estimates made by comparing the reported annual number of vaccinations given to 0–11-month-olds with the estimated birth cohort in each zone (Ministry of Health, Zaire, unpublished data, 1988).

Cities with highly developed disease surveillance systems can use surveillance data to identify high-risk neighbourhoods. However, surveillance based on health facility reporting may not accurately represent the geographical distribution of cases.
since in areas where the health services infrastructure is poor, children with measles may not attend health facilities.

Immunization activities should be targeted at low-coverage areas. In Kinshasa, the city EPI manager visits private and public health centres in low-coverage zones to identify those centres that could begin vaccination if cold chain equipment and training were provided. The programme offers vaccines free to private centres to encourage them to vaccinate. Health centres must submit reports of vaccination activities in order to receive their next month's supply of vaccine, and donor agencies collaborate in the effort to reach the low-coverage zones. The Salvation Army organizes outreach visits to peripheral areas, and the Catholic Diocese has contacted parish councils to determine appropriate sites for establishing new health posts, which are visited at weekly or monthly intervals depending on resources. Coverage for measles vaccine among 12–23-month-olds increased from 45% in 1986 to 68% in 1990 for children with cards, and from 59% to 89%, respectively, if a verbal history of immunization was accepted for children without cards (Ministry of Health, Zaire, unpublished data).

In Pikine, Senegal, the community has participated in providing services. Health committees have been formed in underserved areas, and health units, often in private houses, created. The community general assembly determined and published the consultation fees, and a central community store was established to provide drugs, vaccines, and materials. Each health committee designated one person to collect fees at the health unit, and also determined the allocation of resources. Most personnel costs are paid by the government, while the community pays 25–50% of the running costs (25).

Some cities have used campaigns to reach underserved areas; however, unless the activities can be sustained the benefits may be short-lived. In Conakry, a series of mass vaccination campaigns was conducted in 1986–87. The proportion of fully vaccinated children reached 57% immediately following the campaigns, but by April 1989 had fallen again to 17% (9).

Identifying and vaccinating eligible individuals

Once vaccination services become accessible, efforts should be made to increase community motivation and to ensure that children complete the immunization series. Although the urban poor have been labelled as apathetic and lacking in social organization, urban programmes are increasingly adopting the neighbourhood and house-to-house approach to community motivation (3). For example, in Addis Ababa, organizers carry out house-to-house registration of eligible individuals and tracing of defaulters, publicity is issued through the media, and a prize is given to the most successful communities. In addition to mobilizing for immunization, the community outreach programme has constructed latrines in slum areas, provided community garbage collection bins, supplied oral rehydration salts for treatment of diarrhoea and given training in oral rehydration techniques, weaning, and other health education activities (26).

In Khartoum a system of birth registration and follow-up of defaulters has been developed. Registration cards are completed for each birth notified to the clinic by midwives and are classed according to the month of the child's next visit. If the child does not appear, midwives visit the family to remind the parents of the immunizations required. Although coverage increased after implementing this system, whether the house visits can be sustained is questionable (28).

In Mozambique, health staff and community representatives conduct house-to-house visits to identify eligible children and refer them to the nearest health centre or outreach session.

In coverage surveys, the proportion of children aged 12–23 months with documented receipt of all vaccines increased in Maputo from 38% in 1982 to 84% in 1986, and in four other cities from an average of 36% in 1985 to 55% in 1987 (13).

Some cities use home visits to identify and refer defaulters from other services, such as tuberculosis patients and family planning users. Estimates of mobilization costs to the Mozambican health services in 1986 were US$ 0.50–1.20 per child under 1 year of age. Mobilization accounted for more than 40% of personnel costs. In addition, community representatives devoted over 1000 days of voluntary labour in 1986 in each city that conducted home visits (27).

Other health education methods complement community-based mobilization. For example, in Maputo city fundamentials of vaccination and other primary health care activities are included in the school curriculum; and in Kinshasa, the Catholic Diocese includes health education about immunization in parish bulletins, and church leaders help to inform the community about outreach visits. Both these cities also use the mass media and patient education in health centres.

Improving disease surveillance

Surveillance data can identify high-risk populations and provide information about the effectiveness of EPI. The programme's impact can be measured by routine disease notification or by using sentinel sites.
In Maputo, which has a centralized health service management and 19 public health centres, the routine notification system from all these centres as well as hospitals is used to monitor the impact on measles. Sentinel sites report neonatal tetanus (four maternity hospitals), and poliomyelitis (central physiotherapy department). Since 1986 approximately 90% of under-1-year-olds each year have received BCG and measles vaccines and three doses of diphtheria–pertussis–tetanus (DPT) and poliomyelitis vaccines. This sustained high coverage has had an impact, as shown in Fig. 1–3 (Maputo City Health Department, annual report, 1989).

In Kinshasa, where there are over 200 health facilities that vaccinate and many more that provide curative care, a sentinel surveillance system was established in 1981. The major rehabilitation centre reports cases of poliomyelitis, and four major hospitals and nine health centres report measles, diarrhoea, and malaria cases.

Outbreak investigations can provide more detailed information about target diseases, especially when surveillance systems are rudimentary. Information on the age groups most affected, geographical distribution, transmission patterns, risk factors for disease, and vaccine efficacy can often be obtained more readily from such investigations than from routine data.

Special disease control interventions

As new vaccines become available, schedules may be modified to improve disease control. High-dose measles vaccines now make it possible to vaccinate children at 6 months of age (29). A demonstration project is being carried out in Kinshasa to assess the impact on measles morbidity and mortality of administering Edmonston–Zagreb measles vaccine to 6-month-olds, together with activities to increase coverage.

Conclusions

EPI has made substantial progress in extending the basic infrastructure for its operation in Africa, where the average coverage with measles vaccine increased from 16% in 1983 to 45% in 1988.\(^c\)

Focusing attention on underserved areas in urban slums and squatter settlements will contribute greatly to the overall goals, since these areas account for 30–50% of urban populations, have a large burden of disease mortality, and act as sources of infection for cities as a whole and for surrounding rural areas. Operational research can assist managers to conduct urban situation assessments, to identify high-risk areas on a “micro” level, and to design and monitor interventions. While many cities have made progress towards improving the quality of public health services and motivating the community, questions remain about how to involve effectively the private sector, how to increase the motivation of poorly remunerated public sector health personnel, and how to sustain services.

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Résumé
Stratégie d’amélioration des services de vaccination en Afrique urbaine

En l’an 2000, on s’attend à ce que la moitié de la population du monde vive dans des régions urbaines. Si ces régions paraissent avoir de nombreux avantages par rapport au milieu rural, les pauvres des régions urbaines, qui représentent 30 à 50% de la population des villes des pays en développement, ont des problèmes qui ont souvent été méconnus par les planificateurs. S’intéresser davantage aux taudis urbains mal desservis et aux logements occupés par des squatters permettrait aux programmes de vaccination de mieux atteindre leur but, car dans ces zones se trouve une large proportion des populations urbaines, l’accès aux services de santé y est médiocre, elles sont victimes d’une importante mortalité par maladie, et constituent des sources d’infection pour la ville et pour les régions rurales environnantes. En ce qui concerne la rougeole, la densité d’habitants dans les villes rend difficile la lutte contre la maladie, même dans des zones où la couverture vaccinale moyenne est relativement élevée. La prestation de services urbains de vaccination se heurte à d’importants problèmes: surpeuplement, priorités contradictoires des parents, taux élevés de migration, infrastructure des services de santé telle qu’ils offrent avant tout des services curatifs aux classes moyen-

References


