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Integration of immunization services with other health interventions in the developing world: what works and why? Systematic literature review

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Summary

OBJECTIVE To assess benefits, challenges and characteristics of integrating child and maternal health services with immunization programmes.

METHODS Literature review using journal databases and grey literature. Papers meeting the inclusion criteria were rated for the quality of methodology and relevant information was systematically abstracted.

RESULTS Integrated services were vitamin A supplementation, bednet distribution, deworming tablet distribution, Intermittent Preventive Therapy for infants and referrals for family planning services. Two key characteristics of success were compatibility between interventions and presence of a strong immunization service prior to integration. Overburdened staff, unequal resource allocation and logistical difficulties were mentioned as risks of integration, whereas rapid uptake of the linked intervention and less competition for resources were listed as two key benefits of integration.

CONCLUSION The theoretical strengths of integrating other health services with immunization services remain to be rigorously proved in practice. When additional interventions are carefully selected for compatibility and when they receive adequate support, coverage of these interventions may improve, provided immunization coverage is already high. Evidence for the effectiveness of integration in increasing efficiency of resource use was insufficient and most benefits and challenges were not statistically quantified. More substantive information about the costs of integrated *vs.* vertical programmes and full documentation of the impacts of integration on immunization services should be published.

keywords immunization, vaccination, integration, review

Introduction

The Expanded Program on Immunization, targeting primarily mothers and children, is recognized as one of the most widely implemented and well-established health programmes in the world (WHO 2005). Its characteristics led to the concept of 'integrating' the delivery of other maternal health and child-survival interventions with immunization services. Interest in this approach increased when the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) included such integration as one of four key strategic areas of the 2006–2015 Global Immunization and Vision Strategy (GIVS) framework (WHO 2005).

Although the theoretical strength of integration is recognized, we have been unable to find any comprehensive review of its feasibility, sustainability or impact (Unger 2003). Thus, we systematically reviewed the literature on interventions that have been integrated with immunization services at the delivery level to identify the programmes which have tried this approach, describe key benefits and risks of the integration strategy, highlight programme characteristics critical to successful integration and outline future research needs. This review may assist health programme managers considering integration of similar programmes, guide those designing studies of integrated programmes in selecting key variables to analyse and show both managers and researchers where the knowledge gaps lie in our understanding of the integration strategy.

Methods

Literature search

We used 48 keywords, singularly and in combination, to search grey and peer-reviewed online literature databases

Table 1 Search strategy

Keywords used or in combination		
Integration	Deworming	Intermittent
Synergy	Malaria	Polio
Synergies	Maternal	Asia
Partnership$	Reproductive	India
Linkage$	Health	Joint
Immunization$	Measles	Combine
Vaccination$	Bednet$	Combination
Link$	Net$	
Collaborate	Vaccination$	
Collaboration$	EPI	
Integrating	Disease$	
Partner$	Vitamin A	
Africa	Filariasis	
Integrate$	Family planning	
Immunization plus	Polio	
Routine	Trachoma	
Campaign$	Onchocerciasis	
Malaria	IPTI	
Lymphatic filariasis	Onchocerciasis	
Filariasis	Vitamin A	
Schistosomiasis	Trachoma	
Literature databases searched		
Access UN	CSA-illumina databases	PAIS
AccessScience	Dissertation abstracts	POPLINE
AGRICOLA	EMBASE	Population Index
Bioline International	Expanded academic ASAP	Proquest Research Library
BioMed Central	Global health	PubMed
BIOSIS	IBSS	SIGLE
CAB Abstracts	IndMed	UNDP Project Reports
CHID Online	LexisNexis academic	Web of Science
CINAHL	LILACS	WHOLIS
Cochrane Library	Ovid MEDLINE	
Websites reviewed		
http://www.basics.org	http://www.ifrc.org	http://www.savethechildren.org
http://www.bl.uk/services/document/greylit.html	http://www.msh.org	http://www.savethechildren.org.uk
http://www.care.org	http://www.nyam.org/library/greylitorgs.shtml	http://www.trachoma.org
http://www.fhi.org	http://www.paho.org	http://www.un.org
http://www.filariasis.org	http://www.path.org	http://www.undp.org
http://www.gavialliance.org	http://www.pathfind.org	http://www.vaccinealliance.org
http://www.greynet.org	http://www.psi.org	http://www.who.int/library/
http://www.hki.org	http://www.redcross.org	
Organizations contacted		
BASICS	Liverpool School of Tropical Medicine	World Bank
International Federation of Red Cross & Red Crescent Societies	Centers for Disease Control & Prevention	Rollins School of Public Health
World Health Organization	London School of Hygiene and Tropical Medicine	

EPI, Expanded Program on Immunization.

for literature published from 1970 to May 2005 in English or Spanish (Table 1). Grey literature was defined as material not published in a peer-reviewed journal; it was collected through contact with field experts, internet searches and requests to organizations known to conduct integrated projects. The bibliographies of identified litera-

ture were also used as a source for relevant articles. Grey and peer-reviewed papers identified were screened for primary research on the operational integration of routine or campaign immunization services with any other health intervention at the service delivery level in a low- or middle-income country as defined by the World Bank. All papers which met all these criteria were systematically reviewed.

Systematic review method

To assist in comparing research results, each paper was first sorted into one of three groups by study design: observational study, pre-/post-intervention study or controlled trial study. Next, information was systematically collected from each paper using a data extraction form based on one developed for similar literature reviews (Pegurri *et al.* 2005). Extracted data comprised project location, types of interventions, stated benefits and risks of integration, characteristics of successfully integrated programmes, extent of integration, costs and results. Lastly, to help us in interpretation of the paper's results, we looked for the following critical scientific components: (1) presentation of target population data, (2) use of randomization in study design, (3) presence of well-defined research outcomes, (4) extent of data analysis, (5) discussion of study limitations and (6) comparison of results to published literature. Abstracted data were grouped by the type of intervention integrated with immunization.

Results

The initial keyword search yielded 150 papers, of which 27 met our criteria for inclusion in the review. Nineteen (70%) of the 27 papers were peer-reviewed and eight (30%) were grey literature. Of the 27 papers, 22 (81%) were published after 1998. These 27 papers covered 19 integration projects. In some instances, papers reported on the same integration project.

Of the 19 integration projects studied, 15 (79%) were set in Africa, 11 (58%) integrated delivery of other health interventions with routine immunization services and eight (42%) used immunization campaigns as the integration platform (Table 2).

Integrated programme descriptions and strategies

Three major integration strategies were identified within the 19 projects. The first, which we termed 'linked referral', used a routine immunization contact to inform the child's mother of other health services available in the same facility. The second strategy, termed 'integrated routine delivery', used a routine immunization contact to deliver other health services to the child at the same encounter. The third strategy, termed 'integrated campaign delivery', used an immunization campaign to deliver additional health services to the child.

Seven (26%) of the 27 papers described the offering of family planning services to the child's mother during routine immunization contacts; five (19%) explored the administration of anti-malarial medication to infants during routine immunization contacts (Intermittent Preventive Therapy for infants); eight (30%) described the distribution of vitamin A or deworming tablets in conjunction with campaigns or routine immunization visits; and six (22%) explored the distribution of insecticide-treated bednets (ITNs) through immunization campaigns. In some instances, more than one intervention was integrated with delivery of vaccines (Table 3).

Quality of data collection

Although the literature demonstrates that integrated immunization projects exist, many of these papers did not include information that would have been useful in fully evaluating the impact of integration on cost, feasibility and coverage. For example, although all 12 peer-reviewed papers reporting a trial used control groups, 11 focused on comparisons of biological interactions of drugs administered rather than programmatic aspects of integrating health interventions (Benn *et al.* 1997; WHO/CHD Immunization-linked Vitamin A Supplementation Group 1998; Acosta *et al.* 1999; Schellenberg *et al.* 1999, 2001; Semba *et al.* 1999, 2001; Galindo *et al.* 2000; Bahl *et al.* 2002a,b; Massaga *et al.* 2003). Of the 15 non-trial methodology papers, six (40%) included no information on pre- or post-immunization coverage rates and seven (47%) reported either only pre- or only post-immunization coverage rates. However, 14 (93%) reported pre- and post-coverage rates for linked interventions; the remaining one recorded post-intervention coverage rates. Three (20%) of the 15 papers reported on use of control groups to measure the operational impact of integrating *vs.* not integrating programmes and three (20%) papers reported any information on financial costs (Red Cross & Red Crescent Societies 2004; Grabowsky *et al.* 2005; UNICEF 2005).

Reported impact on coverage rates

The five (19%) of 27 papers describing changes in vaccine coverage after integration of other services reported no

Table 2 Summary descriptions of the 19 integration projects

Country	Linked intervention(s)	Immunization delivery type	Main integration strategy	Project date	Study type	Literature type	References
Zambia	Bednets, mebendazole, vitamin A	Campaign	Deliver all interventions together to child	2003	Pre-/post-evaluation	Grey	Bwalya (2003), Red Cross & Red Crescent Societies (2004)
Togo	Bednets, mebendazole	Campaign	Deliver all interventions together to child	2004	Pre-/post-evaluation	Grey	Wolkon *et al.* (2005), Irby (2005)
Ghana	Bednets	Campaign	Deliver all interventions together to child	2001	Pre-/post-evaluation	Peer-reviewed	Grabowsky *et al.* (2005)
Mali	Bednets, vitamin A	Routine w/ Supplemental Campaign	Deliver bednets when child fully immunized	2003–2005	Pre-/post-evaluation	Grey	UNICEF (2005)
Senegal	Bednets, vitamin A	Routine w/ Supplemental Campaign	Deliver bednets when child fully immunized	2003–2005	Pre-/post-	Grey	UNICEF (2005), WHO and UNICEF (2004)
Niger	Vitamin A	Campaign	Deliver all interventions together to child	1990s	Observation	Grey	Aguayo *et al.* (2003)
India	Vitamin A	Campaign	Deliver all interventions together to child	2000	Observation	Peer-reviewed	Swami and Thakur (2001)
Ethiopia	Family planning	Routine	Family planning referral message to mother at time of child's vaccination. Integrated Data Management	1991	Pre-/post-evaluation	Peer-reviewed	Walley and McDonald (1991)
Togo	Family planning	Routine	Family planning referral message to mother at time of child's vaccination	1994	Trial	Peer-reviewed	Huntington and Aplogan (1994)
Zaire	Family planning	Routine	Family planning referral message and counselling to mother at time of child's vaccination	1992	Pre-/post-	Peer-reviewed	Fisher (1992)
Burundi	Family planning	Routine	Family planning referral message and counselling to mother at time of child's vaccination	1993	Pre-/post-evaluation	Peer-reviewed	Fisher (1992), Birmingham *et al.* (1993)
India	Family planning	Routine	Family planning referral message and counselling to mother at time of child's vaccination	2004	Pre-/post-evaluation	Grey	Nayak (2004)
Madagascar	Family planning	Routine	Family planning referral message and counselling to mother at time of child's vaccination	2004	Pre-/post-evaluation	Grey	BASICS II (2004)
India	Family planning	Routine	Family planning referral message to mother at time of child's vaccination	1983	Observation	Grey	Taylor *et al.* (1983)
Tanzania	Malaria treatment	Routine	Safety of giving Intermittent Protective Treatment of infants alongside immunizations	1999–2001	Clinical trial	Peer-reviewed	Schellenberg *et al.* (1999), Galindo *et al.* (2000), Acosta *et al.* (1999)
Tanzania	Malaria treatment	Routine	Safety of giving amodiquine with immunizations	2003	Clinical trial	Peer-reviewed	Massaga *et al.* (2003)

Table 2 (*Continued*)

Country	Linked intervention(s)	Immunization delivery type	Main integration strategy	Project date	Study type	Literature type	References
Indonesia	Vitamin A	Campaign	Impact of giving vitamin A with immunizations	1999–2001	Clinical trial	Peer-reviewed	Semba *et al.* (1999, 2001)
Ghana, India, Peru (multi-location study)	Vitamin A	Campaign	Impact of giving vitamin A with immunizations	1998–2002	Clinical trial	Peer-reviewed	Bahl *et al.* (2002a,b), WHO/CHD study group (1998)
Guinea-Bissau	Vitamin A	Campaign	Impact of giving vitamin A with immunizations	1997	Clinical trial	Peer-reviewed	Benn *et al.* (1997)

negative impact on immunization service coverage (Table 4). Immunization coverage rate increases varied from 0% in measles vaccinations during a 5-month intervention to 50% in fully immunized children during a 36-month intervention.

The length of the intervention varied by strategy: one project focusing on integrated routine delivery reported a 36-month intervention period whereas the six projects using linked referral averaged 11 months (range: 2–24 months).

Benefits of integration

Eighteen papers (66%) did not discuss benefits of integration, and those benefits that were discussed in other papers were rarely quantified. Nonetheless, it was possible to identify a number of benefits associated with programme integration.

Rapid uptake occurred when an intervention was linked to a robust immunization programme with high coverage rates leading to a rapid increase in coverage for the linked intervention to levels comparable to that of the immunization programme. In two papers, family planning services showed a very rapid uptake over a 2-month period; managers attributed this to linking the new intervention to robust immunization services with 90% pre-integration coverage rates (Birmingham *et al.* 1993; Huntington & Aplogan 1994). Competition fell after integration when two programmes had been competing for the same resources before being integrated (Fisher 1992; Bahl *et al.* 2002b; Diene *et al.* 2004; Grabowsky *et al.* 2005). For instance, one integration project merged ITN distribution with an immunization campaign and allowed the integrated programme to maximize use of human resources rather than competing for workers (Grabowsky *et al.* 2005). Programme managers also described integrated projects as more user-centric because they offered multiple services at once (Grabowsky *et al.* 2005). One paper cited how the community preferred distribution of ITNs and vitamin A tablets through immunization campaigns because this saved them trips to the regional health clinic (Grabowsky *et al.* 2005). Other benefits mentioned were: better staff morale because of a more diverse workload and new learning opportunities (Grabowsky *et al.* 2005); more equity between population sectors by offering multiple services to hard-to-reach communities which had previously been receiving only one service during outreach sessions (Wolkon *et al.* 2005); higher efficiency by reducing the need for the duplicate structures required when health programmes were not integrated (Walley & McDonald 1991); and less stigma attached to traditionally stigmatized services such as family planning (Prabhakara *et al.* 2002).

Table 3 Classification of search results for 27 papers describing integrated projects

Search results, *n* = 27 papers			
Pre-/post-evaluation, *n* = 13 (48%)	Observation, *n* = 2 (7%)	Trial, *n* = 12 (44%)	Study methodology
n = 5 (19%)	*n* = 1 (4%)	*n* = 12 (44%)	Papers rated as 'good' or 'fair'
n = 7 (26%)	*n* = 1 (4%)	*n* = 0 (0%)	Grey literature papers
n = 5 (19%)	*n* = 0 (0%)	*n* = 0 (0%)	Papers with financial costs included
n = 11 (41%)	*n* = 2 (7%)	*n* = 6 (22%)	All integration projects
Programmes integrated with immunization			
n = 5 (19%)	*n* = 1 (4%)	*n* = 1 (4%)	Integration of family planning education
n = 1 (4%)	*n* = 1 (4%)	*n* = 6 (19%)	Integration of vitamin A distribution
n = 6 (22%)	*n* = 0 (0%)	*n* = 0 (0%)	Integration of bednet distribution
n = 0 (0%)	*n* = 0 (0%)	*n* = 5 (19%)	Integration of intermittent protective treatment of infants

Challenges of integration

A number of factors that could hamper integration were cited. The most frequently mentioned was persistently unequal resource allocation – defined as one intervention continuing to receive disproportionately more resources than the other intervention after integration (Nayak 2004) – resulting in poor uptake of the less-funded service.

For example, in an intervention linking family planning to delivery of immunizations, donor financing could not be used to educate health workers regarding pre-natal care. This lack of education was considered responsible for relatively poor community acceptance of pre-natal care compared to other family planning services offered (Walley & McDonald 1991).

Papers mentioned that the non-linked components of semi-integrated programmes might be ignored or that linked interventions were not always accompanied by appropriate education. For example, in a linked bednet-deworming-measles campaign, helminth-control managers were concerned that a focus on drug distribution alone would jeopardise their comprehensive approach of

Table 4 Percentage point change in coverage rates documented by integration studies

Location	Setting	Immunization coverage percentage point change	Linked intervention coverage percentage point change	Intervention length	References
Zambia	Linked campaign	18% – fully immunized	63% – ITN ownership	1 week	Bwalya (2003), Red Cross & Red Crescent Societies (2004)
Togo	Linked campaign	17% – measles	61% – ITN ownership 54% child sleeping under net	1 week	Wolkon *et al.* (2005), Irby (2005)
Ghana	Linked campaign		75% – ITN ownership 56% child sleeping under net	1 week	Grabowsky *et al.* (2005)
Mali	Linked routine	51% – measles 44% – fully immunized	50% – vitamin A 80% – child sleeping under ITN	3 years	UNICEF (2005)
Senegal	Linked routine	13% – measles 50% – fully immunized	26% – vitamin A 86% – child sleeping under ITN	3 years	UNICEF (2005), WHO and UNICEF (2004)
Ethiopia	Linked referral	1% – measles	4% – family planning acceptance	1 year	Walley and McDonald (1991)
Togo	Linked referral		27% – family planning acceptance	2 months	Huntington and Aplogan (1994)
Zaire	Linked referral		19% – family planning acceptance	7 months	Fisher (1992)
Burundi	Linked referral	0% – measles	5% – family planning acceptance	5 months	Birmingham *et al.* (1993)
Madagascar	Linked referral	37% – fully immunized	48% – breastfeeding 32% – child with 5 meals per day	2 years	BASICS II (2004)

ITN, insecticide-treated bednets.

improved sanitation, health education and drug distribution, all of which they felt were needed to reduce helminth carriage (Bwalya 2003). In a post-evaluation of an integrated child health week including ITN distribution and vaccinations, the percentage of children <5 years found to be sleeping under ITNs (44%) was 19% lower than the percentage of households reporting ITN ownership (63%) after the integrated campaign and 47% lower than the reported ITN coverage of eligible children in the campaign (91%), perhaps because no education had been provided at the time of net distribution; this finding prompted door-to-door training in appropriate ITN use (Wolkon *et al.* 2005).

Programme managers have raised concerns about overburdening staff (Swami & Thakur 2001; Wolkon *et al.* 2005). This risk was perceived to be particularly great when staff delivering services received inadequate training. For instance, when distribution of ITNs was integrated with a measles vaccination campaign, workers felt they were not given time to be educated about ITNs and consequently felt they could not educate the community about ITN use (Wolkon *et al.* 2005).

Another study cited the risk of poor integration of data management systems; in this instance, the integrated patient record form was oversimplified to such an extent that it lacked many necessary fields of information (Walley & McDonald 1991). Lastly, one author said that bringing together multiple programmes, ITN distribution, deworming tablet distribution and vaccinations, for an integrated campaign could present logistical challenges. The researchers felt that integrating these services could result in a large and unwieldy system with communication, coordination and planning complexities and would need further investigation (Wolkon *et al.* 2005).

Key characteristics of successful integration

Several characteristics of successful integration programmes were identified by the papers' authors. When adequately taken into account by programme managers, these characteristics were noted to be facilitators of success; inadequately addressed, they were noted to be barriers.

The most frequently discussed characteristic of successful integration was programme compatibility, mentioned in 15 of the 27 papers, which is the appropriate matching of programmes based on health worker skill requirements, programme objectives, recommended timing of interventions, target populations and drug/treatment characteristics. Also important was the existence of a robust immunization service providing high quality training and good supervision to its staff which could translate easily into high coverage with multiple interventions in the target population (Walley & McDonald 1991; Huntington & Aplogan 1994; Diene *et al.* 2004; UNICEF 2005). Support from key stakeholders was critical; these are the community, staff, donors and upper management (Huntington & Aplogan 1994; Aguayo *et al.* 2003; Bwalya 2003; Diene *et al.* 2004). Decentralization of health services, which led to good facility access by providing village-based services in remote areas, was cited as a key to successful integration. These characteristics appeared to build upon each other; for instance the decentralization of health services to the village level was also seen as boosting community support, which in turn led to key stakeholder support for the integrated programme (Walley & McDonald 1991; Aguayo *et al.* 2003; Bwalya 2003; Diene *et al.* 2004).

Discussion

This review revealed that the theoretical strengths of the integration of other health services with immunization are yet to be rigorously proven. Nonetheless, our review shows that when these additional interventions are carefully selected and adequately supported, coverage of these interventions may improve, provided immunization coverage is already high. Integration may lead to strengthening of immunization services (WHO 2005); although this seems at odds with our finding that successful integration may depend in part upon the presence of an already robust immunization service. Where immunization coverage is low, cost and staffing efficiency, a possible benefit of integration, may be a key reason for using the integration strategy. Yet, this strategy may be impeded if one of the linked services lacks sufficiently high coverage before integration. Partnering with any high-coverage, compatible health service may yield positive results for a poorly performing intervention; but linking a low-coverage immunization service with another poorly performing intervention will not result in high coverage; additional research is necessary to provide these answers.

The critical question of whether integrated programmes use resources more efficiently than vertical programmes has yet to be answered.

Cost savings are seen as a major reason to integrate programmes and the basis for WHO's recommendation in Strategy 14 of GIVS is that integration will improve efficiency in comparison to vertical programmes (WHO 2005). In measuring any efficiency gained from integrating systems, costs associated with moving from separate to integrated programmes should be considered, which can include worker re-training and re-education of community members.

Across all studies, programme managers and researchers commented on the critical importance of compatibility between programmes prior to integration to fully capture the potential advantages of integration. Compatibility characteristics included similarities in target population, logistical needs, worker training, stakeholder support, costs and supply chain requirements. Another aspect of integration to consider is the intensity of integration; in some projects, only a single component of a complex health intervention was integrated with immunization services. As such collaborations indicate, programme managers do not need to fully integrate all activities of both programmes but rather should only integrate where value is added.

The majority of the papers we reviewed described benefits of integration that are unique to the integration strategy. When integration is done carefully, there appears to be a decrease in competition for resources and duplication of health systems. The more patient-centred approach which is created can result in increased coverage rates of interventions partnered with a strong health service. The challenges to integration, on the other hand, are not unique to an integrated health system. Rather, they are challenges any health intervention faces: inappropriate resource allocation, poor logistics and data management and overburdened staff. We may then conclude that the risks inherent in integrating health services are not unique, whereas the potential benefits offered are.

When considering integration, programme managers should ensure compatibility of integrated programmes, strengthen proven operational strategies such as training, supervision, outreach and community education, and consider the optimal intensity of integration. Programme managers should build integrated programme strategies through developing a comprehensive plan that addresses re-training of workers so they have balanced knowledge of all linked interventions and are competent to deliver all interventions at once and promote intensive community education to ensure community support and understanding of the need for a transition to an integrated programme.

Conducting and publishing additional research on integration is critical to better understand the risks and benefits of this strategy. Our review was limited to literature databases that we could access by computer and to experts whom we were able to contact via email or phone. Our search discovered many integration programmes that have not been evaluated; studies in of these current programmes could provide useful data (Molyneux & Nantulya 2004). Searches of literature databases in other languages such as French, Chinese and Arabic also would likely yield additional articles of value. Further research is needed into 'failed' integration projects for a comprehensive view of risks and benefits; this future research would also benefit from control groups to permit comparison of integrated and non-integrated programmes. A standardized set of process and outcome indicators would facilitate evaluating the feasibility and effectiveness of interventions; possible indicators include efficiency of resource use at all levels, costs of switching from vertical to integrated services, extent of cost sharing between programmes, user satisfaction with the integrated programme and documentation that immunization services will not be harmed by integration.

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