ORIGINAL RESEARCH

Rapid Epidemiological Assessment of Health Status in Displaced Populations—An Evolution toward Standardized Minimum Essential Data Sets

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Keywords: assessment; criteria; epidemiology; disaster; management; protocols; needs; displaced populations; data sets; standardization; minimums; International Decade for National Disaster Reduction (IDNDR); rapid epidemiological assessment; sphere project; smart

Abbreviations:
EPI = Expanded Program on Immunization
IDNDR = International Decade for National Disaster Reduction
IDP = internally displaced persons
IFRC = International Federation of the Red Cross
MEDS = Minimum Essential Data Set
MMWR = Morbidity and Mortality Weekly Report
MSF = Médecins Sans Frontières
OFDA = Office of Foreign Disaster Assistance
REA = Rapid Epidemiological Assessment
SMART = Specific Measurable, Accurate, Realistic, Time-Banded
UNHCR = United Nations High Commissioner for Refugees
UNICEF = United Nations Children's Fund
WHO = World Health Organization

Received: 19 September 2002
Accepted: 18 October 2002

Supported in part by funding from the World Health Organization under APW SE/01/500694

Abstract

Rapid epidemiological assessment (REA) has evolved over the past 30 years into an essential tool of disaster management. Small area survey and sampling methods are the major application. While REA is protocol driven, needs assessment of displaced populations remains highly non-standardized. The United Nations and other international organizations continue to call for the development of standardized instruments for post-disaster needs assessment.

This study examines REA protocols from leading agencies in humanitarian health assistance across an evaluation criteria of best-practice attributes. Analysis of inconsistencies and deficits leads to the derivation of a Minimum Essential Data Set (MEDS) proposed for use by relief agencies in post-disaster REA of health status in displaced populations. This data set lends itself to initial assessment, ongoing monitoring, and evaluation of relief efforts. It is expected that the task of rapid epidemiological assessment, and more generally, the professional practice of post-disaster health coordination, will be enhanced by development, acceptance, and use of standardized Minimum Essential Data Sets (MEDS).

Bradt DA, Drummond CM: Rapid epidemiological assessment of health status in displaced populations—An evolution towards standardized minimum essential data sets. *Prehosp Disast Med* 2003; 17(4):178–185.

Introduction

Disaster management is defined by Cuny as the range of activities designed to maintain control over disaster and emergency situations, and to provide a framework for helping at-risk persons to avoid or recover from the impact of the disaster.[1] Epidemiological data are well-recognized as essential to competent disaster management.[1-4] Studies of disaster impact on public health are handicapped by the lack of these data, and especially the lack of real-time, field data acquired in the immediate aftermath of disaster.[2] Information gathering is recognized as the crucial first step in assessing the needs of a disaster-affected population.[3] Moreover, a limited amount of specific information obtained on-site from representative

- Rapid Health Assessment Protocols for Emergencies (WHO)
- Handbook for Emergencies (UNHCR)
- Assisting in Emergencies (UNICEF)
- Handbook for Delegates (IFRC)
- Humanitarian Charter and Minimum Standards in Disaster Response (Sphere)
- Refugee Health (MSF)
- Rapid Health Assessment of Refugee or Displaced Populations (Epicentre)
- Field Operations Guide (OFDA)
- Famine-Affected, Refugee, and Displaced Populations: Recommendations for Public Health Issues (CDC)

Additional References Consulted:

- War and Public Health (ICRC)
- A Framework for Survival (Center for International Health and Cooperation)

Table 1—Reference Protocols[21–29,32–33] (WHO = World Health Organization; UNHCR = United Nations High Commissioner for Refugees; UNICEF = United Nations Children's Fund; IFRC = International Federation of the Red Cross; Sphere = Sphere Project; MSF = Médecins Sans Frontières; OFDA = Office of U. S. Foreign Disasters Assistance; CDC = Center for Disease Control and Prevention; ICRC = International Committee for the Red Cross)

populations will suffice to guide emergency relief efforts in the affected area.[4] The art and science of developing this public health intelligence is the disaster application of rapid epidemiological assessment (REA).

The origins of rapid epidemiological assessment date from the 1970s, when scientists at the World Health Organization (WHO) in its Expanded Program on Immunization (EPI), as well as its Smallpox Eradication Program, experienced constraints in the field while using traditional epidemiological tools in developing countries. Technical constraints involved inadequate census data, medical information, and logistics all contributing to shortcomings of traditional epidemiology in developing countries.[5]

Throughout the 1970s, field personnel pioneered the adaptation of traditional epidemiological techniques to simplified sampling techniques and disease surveillance methods.[6,7] This adaptation of standard epidemiological techniques contributed to the worldwide eradication of smallpox.[8]

By the 1980s, in the United States (US), the Institute of Medicine and the Board of Science and Technology for International Development formed the US National Academy of Sciences Advisory Committee on Health, Biomedical Research, and Development (ACHBRD). Its initial chairman, Dr. D. A. Henderson, was the former head of the WHO Smallpox Eradication Program. In 1981, ACHBRD met to identify unexplored research areas that could contribute to health in developing countries. One such identified area was sampling techniques and surveillance methods used by the EPI and the Smallpox Eradication Program. This area of applied methodological research was identified as "Rapid Epidemiological Assessment" (REA).

The ACHBRD sought to develop the REA as a mechanism for providing reliable health information more rapidly and cheaply than was possible using traditional epidemiological methods. Pioneers of REA adopted techniques from health services research and operations research as well as from traditional epidemiology. While inspired by "quick and dirty" methods of epidemiology used for investigating disease outbreaks, the REA evolved into a coherent field of applied epidemiological research.[10] As the REA matured, five subdivisions evolved. One subdivision ultimately became relevant for disaster management—small area survey and sampling methods. Examples of these methods include lot quality assurance sampling, rapid ethnographic assessment, and the EPI cluster sample survey.

In 1988, disaster management was galvanized by the UN General Assembly through the designation of the 1990s as the International Decade for Natural Disaster Reduction (IDNDR). The UN declaration cited natural disaster sequelae of 3 million dead, 800 million affected, and $US 23 billion in damages over the prior two decades. The declaration called specifically for the development of measures for natural disaster assessment through programs of technical assistance and technology transfer.[11]

In response to the above, the World Health Organization analyzed the implementation of rapid health assessments in disasters. It undertook this analysis primarily for WHO personnel in support of efforts in the disaster-affected country to assess the health impact of a broad range of disasters. In 1990, the WHO published nine protocols outlining its view of best practice in rapid health assessment.[12-20]

These protocols codified several attributes of competently performed REA. The protocols were standardized—they normalized field behavior as well as facilitated data contribution to common databases. The protocols were focused, simple, and flexible—suitable for adaptation to local or national information needs. The protocols also were event-specific, reflecting the unique natural history and consequences of different events. Finally, the protocols drew attention to sentinel events that herald disasters, thus, theoretically decreasing the time to recognition and response.

Following an early contribution by UNICEF in 1986,[21] the literature of REA expanded dramatically during the 1990s. Throughout this decade, UN line agencies, international organizations, governmental organizations, nongovernmental organizations (NGOs), and inter-agency consensus groups all contributed assessment guidelines.[22-28] In 1999, the WHO revised and re-issued its own Rapid Health Assessment Protocols for Emergencies.[29] Instruments for the assessment of disaster public health issues have emerged as intervenor-specific. These ubiquitous instruments typically are multi-purpose and applied to assessments of disaster impact, refugees, and displaced persons, health facilities, and even entire health sectors. While the instruments' generic nature offered consistency for one organization across different field settings and different disaster assessors, the multiplicity of instruments has complicated inter-agency information management. Recent disasters have prompted a rethink of such instruments.

Criterion	Source		
	WHO	UNHCR	UNICEF
Disaster Specificity	Specific (10 protocols)	Specific (refugee disaster)	Non-specific
Assessment Focus	Site-focused (complex emerg) System-focused (others)	Site and system-focused	Site and system- focused
Metadata	Captured	Not captured	Variable
Priorities	Critical	Critical	Critical
Indicators	Most SMART	Most SMART	Most SMART
Benchmarks	In Annex	In appendix	In different chapters
Data Structure	Template and checklist	Checklist	Checklist
Portability	High	Low	Low
Time Needed	Unstated; protocol variable	Unstated	Unstated
Field Utility	High (complex emergency); Low (others)	Low	Low

Criterion	Source		
	IFRC	SPHERE	MSF
Disaster Specificity	Non-specific	Non-specific	Non-specific
Assessment Focus	Site and system-focused	Site and system-focused	Site and system-focused
Metadata	Not captured	Variable	Captured
Priorities	Critical	Critical	Critical
Indicators	Most SMART (water, food); Absent (sanitation)	Most SMART	Most SMART
Benchmarks	In different chapters	In appendix	In appendix
Data Structure	Checklist	Template (from MSF)	Template and checklist
Portability	Low	Low	Intermediate
Time Needed	Unstated	Unstated	Unstated
Field Utility	Low	High (M & M*, water, san+) Low (health services)	Generally high

Criterion	Source		
	OFDA	MMWR	CDC
Disaster Specificity	Non-specific	Specific (famine-affected, refugee, displaced population)	Specific (famine-affected, refugee, displaced population
Assessment Focus	Site and system-focused	Site and system-focused	Site and system-focused
Metadata	Not captured	Captured	Captured
Priorities	Critical	Critical	Critical
Indicators	Most SMART	Most SMART	Most SMART
Benchmarks	In different sections	In different sections	In different sections
Data Structure	Checklist	Template for M & M*	Template for M & M*
Portability	Low	Intermediate	Intermediate
Time Needed	Unstated	Unstated	Unstated
Field Utility	Low	High (M & M*) Low (other sectors)	High (M & M*) Low (other sectors)

Table 2—Rapid epidemiological assessment protocol evaluation

https://doi.org/10.1017/S1049023X00000479 Published online by Cambridge University Press

Pursuant to Hurricanes Georges and Mitch, the Pan-American Health Organization (PAHO)/WHO recommended instruments for data collection during a disaster be standardized prior to the disaster.[30] More broadly, a task force on quality control of disaster management found needs assessments difficult and subjective, and called for further development of standardized tools.[31]

Study Objective

The objective of the study is to compare current instruments for the conduct of REA in order to develop a standardized MEDS for health needs assessment and ongoing monitoring at sites of displaced populations.

Methods

A literature review of REA was conducted and published guidelines on field assessments were identified. From these references, a study sample for protocols of post-event REAs was compiled from UN agencies, the International Red Cross, US governmental organizations, international non-governmental organizations, and Sphere were developed. Evaluation criteria comprising best-practice attributes were developed, and then the protocols were compared against the criteria. Analysis of inconsistencies and deficits led to the derivation of a minimum essential data set proposed for future, post-disaster REA.

Published reference works entered into the study are listed in Table 1. Published reference works not obtaining entry into the study for want of defined protocols, yet consulted for guidance on evaluation criteria, also are listed in Table 1.

Evaluation Criteria

1. *Disaster Specificity*—Disaster specificity depends on whether the protocol is intended for particular events. This has implications for potential applicability to different disasters.
2. *Assessment Focus*—A site-targeted protocol gathers data from the site of refugees/internally displaced persons (IDPs). A system-targeted protocol gathers data on lifeline systems (water, food supplies, etc.) extending beyond the site of refugees/IDPs. A comprehensive protocol attempts both.
3. *Metadata*—Data sources may be reliable or unreliable. Moreover, follow-up is enabled by contact details of sector-specific informants. Metadata are characterized as captured or not captured by the protocol.
4. *Information Priorities*—Morbidity and mortality are self-evident information priorities on health outcomes. Determinants of health status heavily depend on environmental health services (water, sanitation, food, shelter, vector control). Security stabilization is a precursor to effective, ongoing delivery of environmental health and other services. Social services—family reunification, education—play important roles in the social welfare of the affected community though remain non-critical determinants of post-event health status. Information priorities are characterized as critical (appropriate) or non-critical (inappropriate).
5. *Performance Indicators*—SMART attributes of performance indicators, as adapted from log frame applications, are:
   - Specific
   - Measurable
   - Accurate
   - Realistic
   - Time bounded

   Performance indicators are either SMART or not SMART.
6. *Benchmarks*—Benchmarks are the quantitative standards against which performance indicators are compared. They are present or absent.
7. *Data Structure*—Data structure refers to the layout of data fields stipulated by the protocol. The structure is characterized as checklist or template (fill in the blank).
8. *Portability*—Portability is measured by protocol page length. Several pages of well-organized protocol on A4 or letter paper on a clipboard are clerically portable. Increasing length becomes progressively less portable. Size of the bound volume in which the protocol is published is not a proxy indicator for protocol portability. Portability is characterized as high, intermediate, or low.
9. *Time Needed*—Time estimate is for protocol data gathering and document completion. Actual time required depends upon suitable access to the affected population, size of the population, and presence of knowledgeable, cooperative parties available for interview. Time estimates, where presented, are taken from the source protocol.
10. *Field Utility*—Field utility is evidenced by immediate amenability of the protocol for data entry in the field without further formatting or collation. Utility is characterized as high or low.

    The overall attributes of an ideal protocol format are summarized as:
    - Disaster application specified
    - Assessment focus specified
    - Metadata present
    - Information priorities appropriate
    - Performance indicators SMART
    - Benchmarks present and co-located
    - Data structure explicit
    - Portability maximized
    - Time needed minimized
    - Immediately deployable

Results

The study findings are summarized in Table 2. The WHO and CDC were most explicit in characterizing the etiology of disaster. The WHO developed a range of hazard-specific protocols. The United Nations High Commissioner for Refugees (UNHCR) explicitly identified its beneficiaries not by etiology of the disaster, but by its refugee consequences. Other organizations were non-specific. All organizations made some effort to be comprehensive in scope with addressing site-focused issues as well as system-focused lifeline issues. Metadata, i.e., sources, generally were acknowledged by different references, though protocols were variable in the explicitness by which those data were captured. Information priorities were generically appropriate with SMART indicators commonly sought by

Date _____ Assessor _____
Disaster Name _____ Disaster Type _____
Site Name _____ Location _____

Population Registration Y N Total Pop _____ # households _____
U1 _____(5%) women (15-44) _____(20%) arrivals/wk _____
U5 _____(20%) men (15-44) _____(10%) departures/wk _____
5-14 _____(35%) 45+ _____(15%) typical livelihood _____
Vulnerable groups _____

Security Officer in Charge _____ Camp Leader _____
Indicators incidents at site Y N type _____
Issues _____

Site Mgmt Lead Agency _____ Contact _____ Ph/Fax _____

Indicators original site use _____ area (m^2) _____ area (m^2/p) _____(>30)
road access OK not OK problem _____
water access OK not OK problem _____
drainage OK not OK problem _____
building repair OK not OK problem _____
electricity OK not OK problem _____

Issues _____

Water Lead Agency _____ Contact _____ Ph/Fax _____

Indicators H_2O source _____ liters/p/d _____ (>20)
reservoirs _____ condition at base m from home _____ (<100)
taps _____ running hours/day _____ persons/tap _____ (<200)
turbid Y N color Y N odor Y N
chlorination Y N boiling Y N coliforms/dl _____ (<10)

Issues _____

Sanitation Lead Agency _____ Contact _____ Ph/Fax _____

Indicators # latrines _____ latrine type _____ persons/latrine _____ (<20)
squat plate Y N water seal Y N % blocked _____ (0)
m from H_2O ____ (>100) m from home _____ (<30)
water at latrines Y N hot water Y N soap gm/p/mo _____ (>500)
cleaning supplies Y N maintenance teams Y N printed health messages Y N
clean latrines Y N vermin/vectors Y N type _____ (none)
wash bucket Y N showers Y N persons/shower _____ (<20)
waste drums Y N waste pits Y N persons/pit _____ (<500)

Issues _____

Food Lead Agency _____ Contact _____ Ph/Fax _____

Indicators self-preparation Y N cooking equipment Y N cooking fuel Y N
communal kitchen Y N warehouse food storage Y N
food distribution Y N supp feeding Y N food security Y N
staples _____ kcals/p/d _____ (>2,100)

Issues _____

Non-Food Lead Agency _____ Contact _____ Ph/Fax _____

Indicators mats/mattresses Y N blankets Y N bed nets Y N
hygiene parcels Y N warehouse storage Y N

Issues _____

Table 3—*Needs assessment and monitoring of displaced populations.*
Minimum essential data set with standard benchmarks (Y = yes; N = no; Pop = population; # = number; ph = telephone; M = metres; Kcal/p/d = kcal per day; 1d = per day; wk = week; Tx = treatment)

(cont)

https://doi.org/10.1017/S1049023X00000479 Published online by Cambridge University Press

Shelter Lead Agency_____ Contact_____ Ph/Fax_____

Indicators # tents _____ # buildings_____ building materials_____
sheeting Y N space partitions Y N shelter m^2/p_____(>4)

Issues _____

Medical Lead Agency_____ Contact _____ Ph/Fax _____

Indicators	clinic on site Y N	distance from camp _____	hours open _____
	structure ok Y N	# doctors ____ # nurses ____	fees Y N
	running water Y N	toilet Y N	electricity Y N
	exam tables ____	ORS corner Y N	IVF Y N
	dispensary Y N	x-ray Y N	overnight stay Y N
	standard case definitions Y N		treatment protocols Y N
	total visits/wk ____	active case finding Y N	% total pop/d ____ (<1)
	total deaths/wk ____	active death finding Y N	deaths/10k p/d ____ (<1)
	total referrals/wk ____	referral destination _____	
Incidence	watery diarrhea	case definition _____	
(past week)	Tx for watery diarrhea _____		ORS prep demonstrated Y N
	dysentery____	visually confirmed Y N	
	ARI____	Dx of pneumonia by x-ray Y N	
	measles____	immunization campaign Y N	cold chain intact Y N
	malaria ____	microscopically confirmed Y N	falciparum Y N
	epidemics Y N	type_____	epidemic control plan Y N
	malnutrition____	type_____	therapeutic feeding Y N
	trauma ____	type _____	
	psych ____	fear in population Y N	reason_____
	provider stated needs _____		

Issues _____

Issues Summary

1. _____
2. _____
3. _____
4. _____
5. _____

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Table 3— *(cont)* Needs assessment and monitoring of displaced populations.
Minimum essential data set with standard benchmarks (Y = yes; N = no; Pop = population; # = number; ph = telephone; M = metres; Kcal/p/d = kcal per day; 1d = per day; wk = week; Tx = treatment)

all organizations. However, the quantity and specificity of performance indicators varied markedly. All organizations presented some benchmarks for their criteria though Médecins Sans Frontières (MSF) was unique in explicitly identifying the objective (norm) associated with its benchmarks in some of its assessment forms. In general, benchmarks were scattered throughout the text of the reference with the protocols. Data structure was variable with checklist and template the most common formats. Portability of protocol varied markedly—the Office of Foreign Disaster Assistance's (OFDA) extensive checklist ran for 27 pages. Only Epicentre estimated time targets for completing an assessment. Utility generally was considered commensurate with extent of template development.

Discussion

Data collection ideally yields information relevant for decision-making. In post-event disaster management, this information focuses on four core issues:

1. What is the most severely affected geographic area and catchment population?
2. What are unmet needs?
3. What goods and services are appropriate for the current phase of post-disaster response?

4. Is the intervention amenable to on-going surveillance and monitoring?

The study demonstrates that different agencies providing humanitarian health assistance utilize markedly different data gathering instruments. Some of this variability stems from differing purposes for which the data are collected. Such purposes may include site needs assessment and monitoring, morbidity and mortality reporting, and periodic health situation reporting. While a generic assessment template may serve various purposes, these different purposes generally impose different methodological burdens.

Moreover, even given a specific purpose for data collection, such as site needs assessment, methodological inconsistencies challenge data acquisition and analysis in numerous ways:

- Information priorities;
- Performance indicators;
- Benchmarks;
- Timeliness of data;
- Imputation of denominators;
- Data architecture;
- Instrument portability; and/or
- Ease of data collection

These recurring inconsistencies undermine reliability of findings.

Health professionals from relief agencies commonly share data to most efficiently assess field conditions, prioritize interventions, and coordinate relief activities. To organize this data pool, UN agency medical coordinators spend precious time in the critical early stages of disaster response developing consensus on data gathering instruments. This study suggests that agency-specific protocols are the least explicit and most variable in application for which they are needed most urgently—site needs assessment and periodic health situation reporting. By contrast, the authors have observed the most consistent data structure in the field in the weekly reporting form for morbidity and mortality. Initially devised by the Center for Disease Control and Prevention (CDC), and published in 1992, this form appears to have nearly universal application in humanitarian health assistance.

Improvements to health needs assessment and monitoring at sites of displaced populations may obtain from refinements to criteria in the protocol evaluation:

1. *Serially preemptive information priorities*—enhance attention to critical issues;
2. *Sector specific metadata*—enhance follow-up contact with key informants and reproducibility of findings;
3. *Fixed data layout*—enhance data entry;
4. *SMART performance indicators with co-located benchmarks*—enhance interpretation;
5. *Length limits of 2 pages*—enhance portability; and
6. *Time needed <2 hours for one trained investigator in a population of 10,000 with knowledgeable, cooperative parties available for interview*—enhance utility.

One dilemma is the scope of the assessment. If the assessment comprehensively encompasses both the site and lifeline systems that support it, then competing objectives of portability and efficiency (short-time targets) will be incompatible. It is proposed that the purpose of a site needs assessment is to identify problems that exist at the level of the occupant. In the early phases of REA, time is critical. If occupants experience no problems with particular deliverables, e.g., water, food, or clinical care, then the relevant lifelines clearly are functional for the beneficiaries at that time. Hence, from the site-specific perspective, further investigation is not essential at that time. However, if the occupants experience problems with particular deliverables, then a site-specific assessment may be inadequate to identify the underlying problem for beneficiaries in the specific relief sector. At that point, a more thorough investigation of the lifeline beyond the confines of the site may be necessary.

A template for REA of health status in displaced populations that incorporates these improvements is in Table 3. The instrument is intended to facilitate field data gathering at sites of displaced populations for health needs assessment and ongoing monitoring by health coordinators. The instrument presents the major determinants of health in priority fashion ranging from security to environmental health to clinical care. The instrument, thereby, comprises a Minimum, Essential Data Set (MEDS) enabling the health coordinator to remain cognizant of broad issues across various sectors, yet, to understand in relative detail the local health issues for which he/she has responsibility. To this end, the fundamentals of health-care delivery are specifically examined—standardized case management, clinical case definitions, treatment protocols, and referral guidelines. Moreover, the template enables capture of metadata, fixes the subsector data layout, co-locates performance indicators with benchmarks, and facilitates portability.

The authors have applied this template in natural and complex emergencies for the past three years. With knowledgeable informants, one experienced assessor may complete an assessment of a population of 10,000 persons in less than two hours. For populations >10,000 persons, the rate-limiting step in REA occurs with assessment of environmental health—particularly quantitative measures of sanitation. It is expected field experience by multiple users will enable validation of findings and further refinement of the instrument.

Conclusion

Understanding the purposes of assessment and needs of information users is fundamental to appropriate field data gathering on displaced populations. There will be competing exigencies of comprehensiveness and brevity. It is expected that the task of rapid epidemiological assessment, and more generally, the professional practice of disaster health coordination, will be enhanced by development, acceptance, and use of standardized Minimum Essential Data Sets (MEDS).

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