
Green Project Management – A Case Study in Sustainability

Management of Chemical Containers for Social Good:

Child Health and Nutrition

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Abstract

The hazardous materials are defined as materials that represent a risk to human health, property, or the environment due to their physical or chemical characteristics. They differentiate from hazardous waste in the fact of it is any material unwanted and cannot be reused or is a spent chemical which must be disposed. In this work, the author focuses on chemical containers with traces of agrochemicals that come out of use of agricultural producers and how, with a proper management, processing and marketing can to be used to impact positively on the child health and nutrition, contributing in the fight against the child malnutrition.

This paper studies the case of an agreement between governmental institutions focused on agriculture, a polyolefin (plastic) recycling company and three childcare non-governmental organizations. The management container scheme used includes cleaning with the triple rising method, classification as non-hazardous materials according to FAO (Food and Agriculture Organization of the United Nations), recycling into new product and selling into the secondary materials market, and applying the economic benefits directly to child health and nutrition. As a result, the author concludes, if this mechanism is replicated worldwide, organizations that adheres United Nations Global Compact can significantly contribute to achieving the 4th Millennium Development Goal, which calls for reducing by two thirds the under-five child mortality by 2015.

Keywords: Chemical containers, triple rising method, recycling, child malnutrition, Millennium Development Goals, Food and Agriculture Organization of the United Nations, under five child mortality

1. Introduction

According to the latest estimates on child mortality **Levels and Trends in Child Mortality, Report 2013**¹ “the leading causes of death among children under age five include pneumonia (17 percent of all under-five deaths), preterm birth complications (15 percent), intrapartum complications (complications during birth; 10 percent), diarrhea (9 percent) and malaria (7 percent). Globally, **about 45 percent of under-five deaths are attributable to undernutrition, which is 3.1 million children each year**”.

The World Health Organization (WHO) in its Fact sheet N°290², updated May 2014, in regard with the Millennium Development Goals (MDGs) publishes: “*Undernutrition which includes fetal growth restriction, stunting, wasting and deficiencies of vitamin A and zinc, along with suboptimal breastfeeding; is the underlying cause of death in an estimated 45% of all deaths among children under 5 years of age. The proportion of underweight children in developing countries has declined from **25% to 15% between 1990 and 2012**. This rate of progress is close to the rate required to meet the MDG target, however improvements have been unevenly distributed between and within different regions*”.

The WHO recognizes the significant progress has been globally made in reducing mortality in children under 5 years of age “*In **2012, 6.6 million** children under 5 died, compared with **12.6 million in 1990**. Between 1990 and 2012, under-5 mortality declined by 47%, from an estimated rate of 90 deaths per 1000 live births to 48.*”

However, in spite of “*The global rate of decline has also accelerated in recent years – from 1.2% per annum during 1990–1995 to 3.9% during 2005–2012, **the world is unlikely to achieve the MDG target of a two-thirds reduction in 1990 mortality levels by the year 2015***”.

More alarming hunger statistics are presented by the World Food Program (WFP)³:

- **842 million people** in the world do not have enough to eat. This number has fallen by 17 percent since 1990.
- The vast majority of hungry people (**827 million**) live in developing countries, where 14.3 percent of the population is undernourished.
- Asia has **the largest number of hungry** people (over 500 million) but Sub-Saharan Africa has the highest **prevalence** (24.8 percent of population).
- **If women** farmers had the same access to resources as men, the number of hungry in the world could be **reduced by up to 150 million**.
- One out of six children -- roughly 100 million -- in developing countries is **underweight**.
- One in four of the world's **children are stunted**. In developing countries the proportion can rise to one in three.
- 80 percent of the world's stunted children **live in just 20 countries**.
- 66 million primary school-age **children attend classes hungry** across the developing world, with 23 million in Africa alone.

¹ (UN Inter-agency Group on Child Mortality Estimation, 2013)

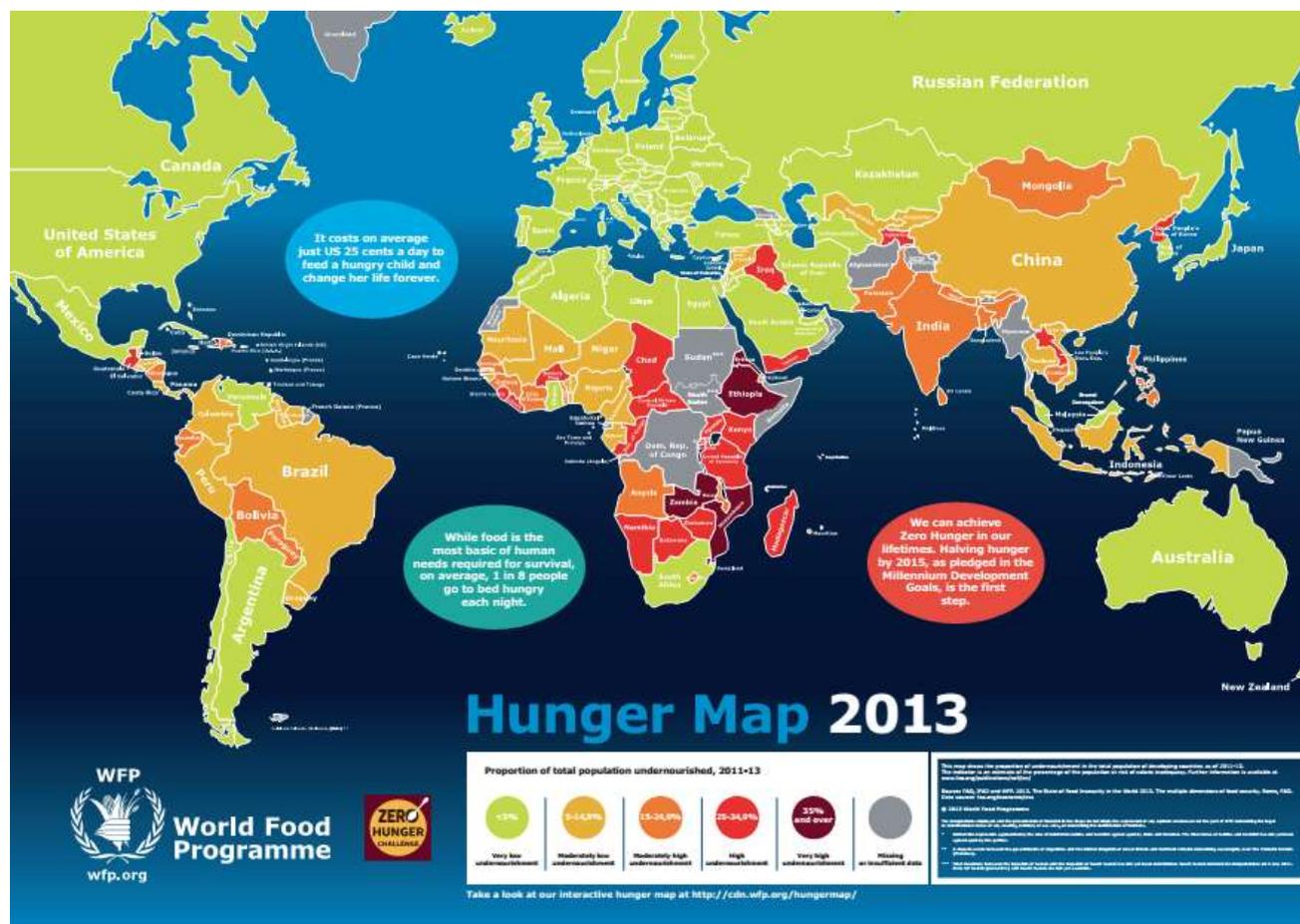
² (World Health Organization, 2014)

³ (World Food Programme, 2014)

WFP calculates that US\$3.2 billion is needed per year to reach all 66 million hungry school-age children.

The map of Hungry⁴ and Statistics⁵, included at the present work, shows how malnutrition is distributed in the world.

In the opinion of this Author, **the malnutrition undoubtedly is an unacceptable flagellum.**



(World Food Programme, 2014)

Figure 1: Hunger Map 2013

⁴ (World Food Programme, 2014)

⁵ (UN Inter-agency Group on Child Mortality Estimation, 2013)

Region	1990	1995	2000	2005	2010	2012	MDG 2015 Target	Percent Decline 1990-2012	Annual rate of reduction (percent)		
									1990-2012	1990-2012	2000-2012
Developed regions	15	11	10	8	7	6	5	57	3.8	3.9	3.8
Developing regions	99	93	83	69	57	53	33	47	2.9	1.8	3.8
Northern Africa	73	57	43	31	24	22	24	69	5.4	5.3	5.5
Sub-Saharan Africa	177	170	155	130	106	98	59	45	2.7	1.4	3.8
Latin America and the Caribbean	54	43	32	25	23	19	18	65	4.7	5.1	4.4
Caucasus and Central Asia	73	73	62	49	39	36	24	50	3.2	1.6	4.5
Eastern Asia	53	46	37	24	16	14	18	74	6.1	3.7	8.0
Excluding China	27	33	31	20	17	15	9	45	2.7	-1.2	5.9
Southern Asia	126	109	92	76	63	58	42	54	3.5	3.1	3.9
Excluding India	125	109	93	78	66	61	42	51	3.3	3.0	3.5
South-eastern Asia	71	58	48	38	33	30	24	57	3.9	3.9	3.8
Western Asia	65	54	42	34	26	25	22	62	4.4	4.4	4.5
Oceania	74	70	67	64	58	55	25	26	1.4	1.0	1.7
World	90	85	75	63	52	48	30	47	2.9	1.7	3.8

Table 1: Country, regional and global estimates of under-five, infant and neonatal mortality⁶

The challenge

There are over 35 established container management programs operating in countries around the world⁷: Australia, Austria, Argentina, Belgium, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Croatia, Dominican Republic, Ecuador, Eire, El Salvador, France, Germany, Guatemala, Honduras, Hungary, Luxembourg, Mexico, Netherlands, Nicaragua, Panama, Paraguay, Peru, Poland, Portugal, Romania, Slovenia, Spain, United States, Uruguay and Venezuela, with millions⁸ of tons of containers recycled **that could be sold in the secondary market and whose benefits be directly applied to child health and nutrition, with the support of the local governments via tax levy reduction and incentives necessary to encourage more stakeholders of these programs.**

Just as an illustrative data, the European Crop Protection Association (ECPA)⁹ estimates that “there are around 34,000 tonnes of crop protection containers placed on the European market each year”.

⁶ (UNICEF - WHO - THE WORLD BANCK - UNITED NATIONS, 2013)

⁷ <http://croplife.org/crop-protection/stewardship/container-management/> Some examples are: Australia, Austria, Argentina, Belgium, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Croatia, Dominican Republic, Ecuador, Eire, El Salvador, France, Germany, Guatemala, Honduras, Hungary, Luxembourg, Mexico, Netherlands, Nicaragua, Panama, Paraguay, Peru, Poland, Portugal, Romania, Slovenia, Spain, United States, Uruguay and Venezuela

⁸ (Food and Agriculture Organization of the United Nations, 2008, pág. 40)

⁹ (European Crop Protection Association, 2007)

By its part, the U.S. Environmental Protection Agency¹⁰ gives to knowledge the following:

- 32 million tons of plastic waste was generated in 2012, representing 12.7 percent of total MSW.
- In 2012, the United States generated almost 14 million tons of plastics as containers and packaging.
- Only 9 percent of the total plastic waste generated in 2012 was recovered for recycling.

Research question

Is it possible to achieving the 4th Millennium Development Goal, which calls for reducing by two thirds the child mortality under five by 2015, directly applying the benefits obtained from the container management programs worldwide?

2. Non-hazardous classification for rinsed containers

The Food and Agriculture Organization¹¹ and the World Health Organization¹² *recommend that countries should classify properly rinsed containers that have been inspected as non-hazardous*. However it has not made a decision yet.

A very comprehensive and enlightening report prepared by the European Crop Protection Association¹³ titled "The case for a non-hazardous waste classification"¹⁴, *proposes that the European Commission takes action both on making container rinsing a legal requirement and ensuring that a non-hazardous waste classification for decontaminated crop protection plastic containers exists in all Member States*. This document makes also reference to the position of current EU legislation with regard this subject "In general, individual decontaminated crop protection plastic containers produced on farms are non-hazardous waste. Most of the container waste has a large safety factor which results from the effectiveness of rinsing as a means of decontamination and the threshold levels in the European Waste Catalogue (EWC). Even the limit of non-hazardous classification is met after a correct rinsing (= decontamination)"

Also, The European Waste Catalogue¹⁵ constitutes an important reference on classification of Packaging containing residues of or contaminated by dangerous substances: "Where the concentration of the highly hazardous component is less than 0.1 percent, the packaging is classified as "non-hazardous".

The need to make a decision on this issue lies primarily in the cost of managing waste classified as "hazardous" or "non-hazardous". The transportation is tightly controlled and

¹⁰ (Environmental Protection Agency, United States, 2014)

¹¹ (Food and Agriculture Organization of the United Nations, 2008)

¹² <http://www.who.int/en/>

¹³ <http://www.ecpa.eu>

¹⁴ (European Crop Protection Association, 2007)

¹⁵ (Environmental Protection Agency, Ireland, 2002)

subject to regulatory charges, also the international transboundary movements would likewise have to be subject to the procedures of the Basel Convention¹⁶.

In Germany the cost differential between managing empty containers as hazardous and nonhazardous has been estimated at €0.60 per kilogram of empty container¹⁷

Cleaned pesticide containers are classified in many European and North American countries as “nonhazardous” waste. The results of a survey carried out by ECPA in European Countries in 2006 and included in “The case for a non-hazardous waste classification”¹⁸ are shown in Table 2 below

Country	Waste classification of decontaminated crop protection containers
Austria	N/A
Belgium	Non-hazardous
Bulgaria	N/A
Croatia	Hazardous
Cyprus	N/A
Czech Republic	N/A
Denmark	Non-hazardous
Estonia	Non-hazardous
Finland	Hazardous
France	Within scheme NH, outside H
Germany	Non-hazardous
Greece	Non-hazardous
Hungary	Within scheme NH, outside H
Ireland	Local Variation
Italy	Non-hazardous
Latvia	N/A
Lithuania	Non-hazardous
Luxemburg	Non-hazardous
Malta	N/A
Netherlands	Non-hazardous except T+
Poland	Hazardous
Portugal	Hazardous
Romania	Hazardous
Slovak Republic	Hazardous
Slovenia	NH but T
Spain	Hazardous
Sweden	N/A
Turkey	Hazardous
UK	Non-hazardous

Table 2: Waste classification of decontaminated crop protection containers by Country

¹⁶ <http://www.basel.int/>

¹⁷ European Crop Protection Association. ECPA's Project on Non-Hazardous Classification of AgChem Containers, by Dr. Detlef Döhnert, BASF AG, Germany, 3 May 2006, Brussels, Belgium

¹⁸ (European Crop Protection Association, 2007)

3. Discovery to recovery approach proposed by ECPA

The Figure 2 shows the life cycle of containers from discovery to recovery approach, identifies the stakeholders involved and describes the key waste management features of each step.



(European Crop Protection Association, 2007)

Figure 2: The life cycle of containers from discovery to recovery

4. Chemical Container Management

In this point, the author takes as a reference the Guidelines on Management Options for Empty Pesticide Containers developed by FAO, 2008¹⁹. The following is the foundation necessary to all vested interested in Chemical Container Management.

4.1. Cleaning methodologies

The cleaning methodology to be used depends on the physical and chemical characteristics of the pesticide. Instructions for of the pesticide. Instructions for cleaning the container should be included in the product label and product safety data label and product safety data sheets. Cleaning methodologies are shown in

¹⁹ (Food and Agriculture Organization of the United Nations, 2008)

Table 3: Cleaning Methodologies

Cleaning methodology	Formulation
Rinsing with water using the manual triple rinsing technique, pressure rinsing or integrated rinsing	Emulsifiable concentrates Water soluble products Water soluble solids
Rinsing with solvent	Oil and solvent based products

Table 3: Cleaning Methodologies

Especial attention has to be made in selecting the cleaning methodology. An inappropriately selected cleaning methodology will be at best ineffective and at worst dangerous. The majority of one-way containers²⁰ available on the market are appropriate for rinsing with water.

There are three standard rinsing options:

- Triple rinsing.
- Pressure rinsing.
- Integrated pressure rinsing.

Triple rinsing

Triple rinsing is the method to use in the absence of ad hoc mechanical rinsing equipment. It is likely to be the most practical option in developing economies. It can be used to clean all sizes of containers but the technique is slightly different for small containers that can be shaken by hand, and large containers that are too big to shake.



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Figure 3: Triple Rinsing Procedure

Pressure rinsing

Pressure rinsing equipment uses water under pressure (typically three bar) in the form of a static or rotating spray jet and valve. The jets of water hit the internal surfaces of the container removing and dissolving the pesticide residues. Some pressure rinsing equipment

²⁰ One-way pesticide container: Containers that should not be reused or refilled once the contents have been deployed.

includes a sharp device that penetrates the container walls for rinsing purposes, thereby offering the additional advantage of making the container unusable for storage.



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Figure 3: Pressure rinsing

Integrated rinsing

Integrated rinsing technology incorporates the rinsing process directly into large scale tractormounted spraying equipment. It is the most efficient method of rinsing containers and provides a high level of operator safety. It is also quicker than both triple rinsing and pressure rinsing, provides both efficient rinsing and even greater operator safety. This avoids spillage, which may expose the operator to unnecessary risk.



(Copyrighted by BayerCropScience)

Figure 4: Integrated rinsing

Solvent rinsing

For pesticides that are formulated in a solvent or oil and are not water soluble or dispersible, the rinsing process has to use a solvent as the rinsing medium.

²¹ (Vern, 1993)

²² (University of Florida IFAS (Institute of Food and Agricultural Sciences))

Performance of rinsing techniques

Active ingredient in 1 oz (28g) of liquid remaining in a 5 gallon (22.5L) container		
Rinsing stage	Pesticide residue	Percentage remaining
After draining	14.2 g	100.0%
After 1st rinse	0.2 g	1.4 %
After 2nd rinse	0.003 g	0.021 %
After 3rd rinse	0.00005 g	0.00035%

Table 4: Performance of rinsing technologies

Comparison of rinsing techniques

Features	Pressure Rinsing	Triple Rinsing
Number of Steps	8	17
Time spent per Container	1 – 2 min.	4 – 9 min
Container Types Rinsed	All	All
Special Equipment Needed Rinse	Nozzle/high pressure water	None

Table 5: Comparison of rinsing techniques

4.2. Stakeholder involvement

For a successful container management scheme it is important to engage and involve all stakeholders.

These include:

- governments and their agencies ,
- manufacturers, importers and suppliers
- users,
- NGOs, agricultural colleges and schools, extension services, farmer cooperatives.
- Waste management and recycling organizations.

4.3. Mechanisms for developing a container management scheme

At the moment of determining the structure of a container management scheme consideration needs to be given to its legal basis; how it is funded and incentivized; and the practicalities of its infrastructure and logistics.

Legal basis

There are two models for container management schemes that have been employed to date, the voluntary model and the legally mandatory model.

Voluntary scheme

The voluntary model is a scheme that foresees an organization to set up a scheme without the support of a legal framework from the government. Organizations that have set up

voluntary schemes include the trade associations of pesticide manufacturers, and NGOs. Pesticide trade associations have established many voluntary schemes around the world, as a component of a product stewardship program. NGOs have initiated pilot collections schemes that have then developed into fully fledged schemes

Legally Mandatory scheme

Generally, as part of a pesticides registration and authorization for use, there is a requirement for users to participate in the scheme. If the country chooses the legally mandatory scheme, a sustainable funding mechanism can be established in the regulations. Where levies are imposed on suppliers of pesticides, all are obliged to fund the scheme.

Other legal considerations

Whatever the legal basis for the scheme, its operation needs to comply with all relevant national environmental, waste and transportation laws. In addition, there are international frameworks that should be taken into consideration in the design of the scheme, including:

- International Code of Conduct on the Distribution and Use of Pesticides²³;
- ILO Convention concerning Safety and Health in Agriculture²⁴;
- Stockholm Convention in relation to persistent organic pollutants²⁵;
- Rotterdam Convention in relation to prior informed consent²⁶;
- Basel Convention in relation to environmentally sound management of waste and the transboundary movement of waste²⁷;
- Bamako Convention in relation to the transboundary movement of waste in Africa²⁸

4.4. Economics and incentives

Funding

Schemes need to be economically viable if they are to be sustainable. For legally mandated schemes governments should determine how they wish the scheme to be funded. The options include levies on suppliers, pesticide sales tax, and general taxation.

Levies on suppliers

Levies paid by suppliers are the most common funding mechanism within existing schemes. As discussed above, the management of containers at the end of their life is an external cost directly related to the supply and use of the product. By levying the supplier, these external costs are borne by the organizations responsible for their creation. The quantity of the levy

²³ (FAO, 2005)

²⁴ (ILO, 1990)

²⁵ (UNEP, 2001)

²⁶ (FAO/UNEP, 1998)

²⁷ (UNEP, 1989)

²⁸ (Organization Of African Unity, 1991)

is generally directly proportional to the quantity of pesticides the supplier releases onto the market.

Pesticide sales tax

Pesticide sales tax is paid directly by the purchaser of pesticides, i.e. the user. The amount that the user pays is directly proportional to the amount of pesticide that they buy. It is similar to the levy on suppliers in that the external costs are borne by the organizations and individuals responsible for the empty containers. Unlike the levy, the full cost is passed directly to the user.

General taxation

In this case the funds would come from general taxation, e.g. where the agriculture sector of a country is weak and unable to bear additional costs of a collection scheme, funding from general taxation is a viable solution.

Incentives

Financial incentives can be used to encourage users to return empty containers. A deposit scheme for pesticide containers charged a deposit with the initial purchase. The deposit is redeemable on the return of the empty container. However, there are no such incentives currently being operated. There are two reasons for this. First, there is concern that the scheme would encourage the illegal collection of pesticide containers by both adults and children that do not have the knowledge, skills and equipment to handle them safely. Second, the accounting and administrative costs of running the incentive scheme can be high.

4.5. Infrastructure and logistics

Logistics represent a significant cost to a scheme, particularly in countries where the distances between agricultural areas and the recycling and disposal operations are long. Transporting empty containers is also not efficient due to their high volume to weight ratio. For the scheme to be effective in attracting back empty containers, it must be easy for the users to return them to the scheme. Designing the appropriate infrastructure for logistics is crucial. There are a number of options to consider, as described here below.

4.6. Acceptance from users

Users should be encouraged to return empty containers in a safe manner that does not risk their health or the environment. The safe transportation of pesticides and empty containers should be promoted through awareness raising programs.

4.7. Network of collection centers

The location, opening times and staffing of the collection centers must be convenient to users. Inconvenient locations and opening times will discourage users from returning containers.

The collection centers may be used to undertake segregation of container materials and pre-treatment such as baling and shredding to increase the density and improve the efficiency of the onward transportation. Shredding may also improve the value of the materials for recycling.

For large countries the network could include both local and regional collection centers. The local collection centers provide easy access for users to return containers. The scheme's vehicles can collect from the local collection centers and consolidate the containers at the regional centre. The economies of scale at the regional centre may allow for the pre-treatment and processing to be undertaken efficiently.

Collection centers can be stand-alone facilities dedicated to empty containers, located at sites belonging to members of the supply chain, or located at sites belonging to organizations involved in the recycling and disposal activities.

4.8. Collection

The scheme will need to manage the collection of containers from the collection centers. In the case of large-scale users of pesticides, the scheme may elect to collect the containers directly from the user. There are two options for managing the transportation:

- a fleet of vehicles owned and operated by the scheme; or
- contracts with transport companies with licensed vehicles and trained operators to make collections on behalf of the scheme.

4.9. Pre-treatment

Pre-treatment involves the processing of containers to improve either the efficiency of transport or the recycling and disposal process. The limiting factors for the load that a vehicle may transport are volume and weight. By increasing the materials' density with processes such as shredding, baling and crushing, the weight that vehicles carry can be improved significantly.

These pre-treatment processes can be conducted with fixed or mobile equipment. Fixed equipment remains at the collection centre and processes containers that are delivered. Fixed equipment can be scaled to manage the volumes received at the collection centre at continuous process rates.



(Copyrighted by CropLife International)

*Figure 5: Baling, Crushing, Shredding and Shredded plastic*²⁹

4.10. Recycling

Many of the most advanced container management schemes recycle the collected materials into new products. Provided that the container materials can be properly segregated into sufficiently pure components they can be readily recycled.

High quality and high value plastic products require pure and specific raw materials, so it is very important that the different types of plastic are kept separate. It is possible to make some low grade and low value products from mixed plastics.

Due to the melting temperatures of plastic materials are relatively low, may be insufficient to destroy or drive out the pesticide contamination, the scheme needs to ensure that the recycled plastic is manufactured into products with limited potential for human contact.



(Copyrighted by CropLife International)

*Figure 6: Fence posts and Sewage pipes*³⁰

²⁹ (Food and Agriculture Organization of the United Nations, 2008)

³⁰ (Food and Agriculture Organization of the United Nations, 2008)

4.11. Information and communications

Good communications are crucial to a successful scheme. Users need to be aware of their responsibilities, the techniques for cleaning containers, and where to take containers when they have been emptied and cleaned. The scheme may use any of the following communications channels.

Container label

The registration regulations should stipulate the required information to be displayed on the label. This should be in the local language appropriate to where the product will be marketed. In areas where literacy rates are low, the label should show appropriate symbols demonstrating how the product should be used and how the container should be cleaned. The label should show all the necessary hazard information.

Education programs

Education programs can be run by farmer cooperatives, farmer field schools, NGOs, extension services, agricultural colleges and schools. They can raise awareness of the correct use of pesticides and the disposal of the empty containers. The programs may be supported by training aids, posters, plays, handbooks in the local language and with illustrations for the illiterate. Education is an integral part of the container management scheme.

4.12. Container management schemes around the world

According to the author's research, the FAO have compiled and analyzed the performance of 29 schemes that are operated around the world during years 2004 and 2005. Such analysis compares the quantity of containers put onto the market with the quantity of empty containers that are managed by the schemes. The analysis is shown in Table 6: Performance of Container Management Schemes around the world

Country	Weight of pesticide packaging shipped into Market (kg)		Weight of Pesticide Packaging collected (kg)		% Collected	
	2004	2005	2004	2005	2004	2005
USA	18000000	1800000	3600000	3564000	20,4	19,8
Canada	2778300	2960264	1950480	1975616	70	67
Argentina	5700000	5700000	102600	501600	1,8	8,8
Bolivia	537000	537000	19869	39738	3,7	7,4
Brazil	11706283	1570700	10067403	13665090	86	87
Chile	100000	130000	20000	26000	20	20
Colombia	2365000	2365000	148995	182105	6,3	7,7
Costa Rica	650000	650000	144950	200200	22,3	30,8
Dom Republic	140000	140000	36960	40600	26,4	29
Ecuador	300000	300000	0	24900	0	8,3

El Salvador	355000	360000	99400	136800	28	38
Guatemala	350000	350000	120050	177450	34,3	50,7
Honduras	215000	250000	39990	74000	18,6	29,6
Mexico	3220000	5450000	199640	348800	6,2	6,4
Nicaragua	350000	350000	0	0	0	0
Panama	315000	315000	22050	31500	7	10
Paraguay	1150000	2400000	0	792000	0	33
Peru	625000	800000	6250	32000	1	4
Uruguay	166000	450000	6640	22500	4	5
Venezuela	900000	900000	0	27000	0	3
Australia and New Zealand	2744666	2049021	1070420	1106471	39	54
Austria	350000	350000	245000	245000	70	70
Belgium	585000	585000	538000	538000	92	92
France	7500000	7500000	3200000	3200000	42,7	42,7
Germany	3200000	3000000	1760000	1950000	55	65
Hungary	2763000	2763000	1263000	1263000	45,7	45,7
Poland	2000000	2000000	550000	550000	27,5	27,5
Spain	6672000	6672000	1072000	1072000	16,1	16,1
The Netherlands	1271000	1271000	571950	1143900	45	90
Regions						
N-America	20778300	20960264	5550480	5539616	26.7	26.4
LATAM	29144283	37154000	11034797	16322283	37.9	43.9
Australia/NZ	2744666	2049021	1070420	1106471	39.0	54.0
Europe	24341000	24141000	9199950	9961900	37.8	41.3
Total	77008249	84304285	26855647	32930270	34.9	39.1
Estimate (global):		190 000 000		32 930 270		17.3

Table 6: Performance of Container Management Schemes around the world

As it can be noticed, Netherlands and Brazil has the highest collection efficiency.

The Brazilian scheme³¹ was one of the first to be put in place and is supported by a strong regulatory environment and the involvement of all stakeholders.

Brazil

In Brazil, the collection and recycling of used pesticide containers started as an industry initiative, which was later reinforced by the introduction of a new law requiring farmers, pesticide distributors and producers to return, collect and provide proper final destinations (recycling and incineration) for used containers. In 1993, Brazil's national pesticide industry association (ANDEF) entered into a voluntary agreement with the Agriculture Secretary of the state of Sao Paulo and the sugarcane planters' cooperative to launch a pilot container management scheme. Collected containers were taken to a small plastic recycling company. In the subsequent years, additional states joined hands with ANDEF to promote triple rinsing and to establish collection centers in strategic locations. By the end of 2001, there were 30 such centers in Brazil. Meanwhile, the recycling industry also grew. In December 2001, the National Institute of Empty Containers (inpEV), a non-profit entity dedicated to managing the final destination process of empty pesticide packages, was established, bringing together Brazil's pesticide industry, distributors and farmers.

In 2002, a law regulating the final destination of empty agrochemical containers entered into force. By then there was sufficient experience from the voluntary program of collection and disposal of containers begun earlier. The law requires farmers to practice triple rinsing, return empty containers to receiving stations, and keep the vouchers of package delivery and invoice of product purchase.

Distributors are required to indicate on invoices where the growers are to return the used containers, construct and manage receiving stations, and implement educational programs for end users. Pesticide manufacturers are required to: provide transport, recycling or disposal services for empty packages collected at receiving stations; modify labels to include information about triple rinsing and returning used containers; and implement educational programs for end users with distributors and government.

As of mid-2004, inpEV, in a joint program with distributors, administered 260 collection centers. By the end of 2004, there were about 300 centers, with the goal of eventually increasing the number to 350 – 400. In 1994 there was just one small plastic recycling facility. By the end of 2004, there were nine recycling plants in Brazil. The collection rate varied from state to state: 85 percent in the State of Bahia and 84.2 percent in Paraná, to 21 percent in Espírito Santo and less in some other states in May 2004. In 2003, the total collection was in the order of 7 800 tonnes, representing 35 percent of total packages sold. In 2004, 15 300 tonnes were collected, representing an improved collection rate of 65 percent.

About 95 percent of what is sold can be recycled (plastic, metal, etc.) and the rest is incinerated. InpEV runs extensive awareness and education campaigns, including television advertisements and posters promoting triple rinsing and taking back used containers to collection centers, with positive changes in farmers' behavior.

³¹ (Food and Agriculture Organization of the United Nations, 2008)

More Successful Container Management Schemes

Country	Container Management Scheme	Policy content	Results
AUSTRALIA	drumMUSTER Voluntary scheme. Levy to chemical products to finance the program: \$ 0.04 (€ 0.024) per liter or per kilogram on most products sold	Part of the country's waste management policy. Follows the Polluters-pays principle.	35 percent of total containers sold were collected in 2003. The reported operating cost of the program is € 759/tones.
BELGIUM	Phytofar-Recover. Producer members are invoiced in proportion to the volume of packaging material marketed Annual collection	An agreement requires the final user to hand in and those in charge of packaging to collect and recover packaging waste, in order to promote recycling and valorization of the waste.	92 percent of the estimated total weight of containers sold were collected in 2003. The program cost in 2003 (not including obsolete pesticides) was € 704 229. The cost per kilogram has declined over the years.
CANADA	Stewardshipfirst , voluntary scheme. Levy charged to all pesticide manufacturers at CAD 0.54 (about USD 0.36) per container put on the market to fund the collection and recycling scheme.	For agricultural pesticides, the labels indicate that the container is recyclable and should be returned to one of the 1250 collection centre	The total annual program cost is CAD 4 million (USD 2.9 million).
CHILE	National Association of Manufacturers and Importers of Crop Protection Products” (AFIPA) introduced triple rinsing and established this program in cooperation with national authorities.	“Sanitary Regulation for the Management of Hazardous Waste”, states that triple rinsed containers are classified as nonhazardous waste and must be handled according to the AFIPFA's container management program.	81 tonnes recovered in 2003 and 147 tonnes in 2006.
FRANCE	Adivalor , a voluntary organization. Adivalor brings together agricultural	Rinsable pesticide containers are classified as hazardous waste by law, but Adivalor is	In 2003, the cost of the container management program was € 2 kg of

	organizations, pesticide manufacturers and retailers. Responsibilities and costs are shared.	negotiating with the French authorities for possible revision of the classification.	packaging material.
GERMANY	PAMIRA , voluntary scheme. The industry finances the costs of PAMIRA according to the proportion of primary packaging material put on the German market. The distributors and retailers provide the collection centers.	Properly rinsed and inspected used pesticide containers are classified non-hazardous and are plastic packaging according to the European Waste Catalogue. Therefore, inspected empty containers are not classified under transport regulations.	The cost of PAMIRA in 2003 was €1075/tonne.
HUNGARY	CSEBER . Non-profit coordinating organization. Pesticide manufacturers are charged with a fee according to the container capacity.	The Ministerial Decree 103/2003 on Pesticide Packaging Waste requires farmers to practice triple rinsing, and hand over clean used containers to designated collection sites. CSEBER is required to keep record of its collections	The program cost in 2003 was € 720 000.
USA	ACRC . Non-profit organization. The scheme is funded by members in proportion to the weight of packaging material marketed.	Recycling and disposal of pesticide containers are impacted by federal and state regulations, which designate some pesticide containers as hazardous waste.	The total annual program cost is USD 3.9 million,

Table 7: More Successful Container Management Schemes. Source: the Author

5. CASE DESCRIPCION: The Agreement Chemical Container Management for Social Good

At the beginning of 2007, in the province of Mendoza (Argentina) Baresi SRL³², a Polyolefins Recycling Company, as part of its Corporate Social Responsibility (CSR) Program, celebrated a Convention with – ISCAMEN³³, the Business Chamber of Agrochemicals and Related -

³² <http://baresi.com.ar/>

³³ <http://www.iscamen.com.ar/>

CEAMEN, the Chamber of Agriculture and Fertilizers –CASAFE , the Cooperative for Child Nutrition -CONIN Foundation³⁴, the Helping Nacer Foundation of Neonatal Lagomagiore Hospital - FUNDACER³⁵ - and the Humberto NOTI³⁶ Pediatric Hospital Foundation.

The Main Objective

The objective of the Convention is the management of agrochemical container, according to the Argentinean container management scheme – Agro Limpio³⁷, applying the economic benefits obtained by marketing, directly to child health and nutrition.

Responsibilities

ISCAMEN

- Conduct education programs in relation to safe use of chemicals and container management in all production sectors.
- Increase awareness by radio, TV, newspapers and educational material³⁸ for schools regarding the importance of applying the triple rinse as part of the Good Agricultural Practices (G.A.P.) as established in Argentina by the Standard IRAM 12069 and then drill them to disable them.
- Provide material and human resources required to collect, receive, record, select, inspect and compact the chemical containers from the Collection Points; and transport the bales to Baresi SRL, for recycling.

BARESI SRL

- Extend an accreditation certificate to ISCAMEN of the final destination of each batch.
- Allocate the recovered plastic to manufacturing elements, such as poles, sewer pipes, cones routes, plastic pavers, battery boxes, among other products.
- Apply the economic benefits to the three Foundations. The amount in question represents between 18% and 20% of the value of virgin polyethylene market according to the latest data on the price of High Density Polyethylene (HDPE) blow type.

Besides this percentage agreed, the leadership decided increases it to the 30% of the value of virgin polyethylene market.

³⁴ <http://www.conin.org.ar/>

³⁵ <https://www.youtube.com/watch?v=6azrFKEO4P4>

³⁶ <http://fundacionnotti.com.ar/>

³⁷ (CASAFE: Empresas de tecnología para la protección de los cultivos, 2014)

³⁸ <http://www.casafe.org/prudencio-casafe-y-atolon-drado/>

Foundations: FUNDACER, CONIN and HUMBERTO NOTIFIED PEDIATRIC HOSPITAL

- Allocate funds obtained from the agreement for the specific purposes of the fight against child malnutrition, the intention to support children's health and newborn, and other objectives of their respective constituent statutes.

Who carries out the action?

- Mr. President Leandro Montane ISCAMEN
- Cdor Freddy Brodsky, Managing Partner of Baresi SRL
- Dr. Abel Albino , President of Foundation CONIN
- Mrs. María Eugenia Ibarra Brandi , President of FUNDACER
- Sandro Ricardo Zuppa , Pediatric Hospital Foundation President Humberto NOTTI

Who are the beneficiaries of this initiative?

- Children treated in CONIN - FUNDACER Foundation - Children's Hospital Foundation Humberto NOTTI
- People from community who might unknowingly use the containers with traces of agrochemicals representing a risk for the human and animal's health.

Results

From the beginning, since 2007 to December 2013, Baresi SRL have recycled 74920 kg of containers from the ISCAMEN, which translates in to 39,000 USD³⁹ (0.52 USD per Kg) for the three foundations equally. In turn Baresi SRL receives an annual tax exemption equal to the amount of money donated.

Learning

What did you learn the business? What about the employees?

During this time the company learned new ways to help the community through the coordination of public and private policies. This also helped us take our first steps in CSR being this our most visible externally, in terms of personnel action has been much emphasis on health and safety training , not only for use in the work -up but also giving them tools to implement in their homes with their families.

2012-2013 CONIN REPORT

The average monthly cost of care (cure) per child is approximately \$ 545 ARS (84 USD). CONIN operates in 16 provinces of Argentina. All centers are urban and suburban. CONIN is also present in Latin America with 2 centers in Paraguay and 1 en Perú. Also, the CONIN

³⁹ 1 USD = 6.50 ARS (Diciembre 2013)

methodology⁴⁰ has been replicated in Gambia, Africa Equatorial (through the Catalan Nutrition Without Borders Organization⁴¹).

Doctor Abel Albino⁴², internationally rewarded and awarded, by his labor, states: *"The malnutrition of children, especially in the early life has a direct impact on the size of the brain, causing mental weakness, the only one that can be prevented, the only one that can be reversed, the only man-caused", " we need to end the eternal war of man against man, and start all together the only war worth, the only win-win, man's war against hunger". The formation of the central nervous system is determined in the first 2 years of life. If during this time the child receives no food and needed stimulation, brain growth stops and the same can not develop normally, affecting their IQ and learning ability; running the risk of becoming mentally weak. This damage affects the whole society as the main wealth of a country is its human capital, and if it is damaged, this country has no future. "*

6. Conclusions

Considering the total of 190 tonnes Global Estimated shipped into Market in 2005 were collected, recycled into new product, sold in the secondary materials market and applied the economic benefits directly to child health and nutrition, **more than 2 millions of children could be reached that year**. This value results of applying the World Food Program's calculations to the economic benefits of having recycled and sold that weight of pesticide packaging.

As already mentioned, according to the latest estimates on child mortality Levels and Trends in Child Mortality, Report 2013, the leading causes of death among children under age five include pneumonia (17 percent of all under-five deaths), preterm birth complications (15 percent), intrapartum- complications (complications during birth; 10 percent), diarrhea (9 percent) and malaria (7 percent) and **about 45 percent are attributable to undernutrition, which is 3.1 million children each year**.

Actually, in the middle of year 2014, almost 10 later, the Author can affirm that those **3.1 million under-five deaths attributable to undernutrition** could be avoided if this mechanism is replicated worldwide, significantly contributing to the achievement the 4th Millennium Development Goal, which calls for reducing by two thirds the under-five child mortality by 2015 and positively impacting the post 2015 agenda.

As project, program and portfolio managers, we cannot be indifferent, quite the contrary be sensible, receptive and take an active role, that is, be change agents for a better world with inclusive growth, social equity and progress, between other goals⁴³.

⁴⁰ <http://www.conin.org.ar/metodologia.php>

⁴¹ <http://www.nutricionsinfronteras.org/>

⁴² Abel Albino, President of CONIN Foundation http://www.conin.org.ar/dr_abel_albino.php

⁴³ (González, 2014)

Annex 1

Statistical table: country, regional and global estimates of under-five, infant and neonatal mortality.

Country or territory	Under-five mortality rate (U5MR) (deaths per 1,000 live births)									Millennium Development Goal target for 2015	Annual rate of reduction (ARR) (percent) 1990–2012		
	1990			2000			2012				ARR	Lower bound	Upper bound
	USMR	Lower bound	Upper bound	USMR	Lower bound	Upper bound	USMR	Lower bound	Upper bound				
Afghanistan	176	161	193	134	123	146	99	84	116	59	2.6	1.9	3.4
Albania	43	37	49	29	25	33	17	10	25	14	4.2	2.3	6.5
Algeria	50	47	53	35	34	36	20	13	30	17	4.1	2.2	6.1
Andorra	8	8	9	5	5	5	3	3	4	3	4.3	3.6	5.0
Angola	213	188	240	203	178	229	164	111	236	71	1.2	-0.5	3.0
Antigua and Barbuda	24	18	31	16	14	17	10	7	13	8	3.9	2.1	5.8
Argentina	28	27	28	20	20	21	14	14	15	9	3.0	2.8	3.2
Armenia	49	45	54	30	27	33	16	13	21	16	5.0	3.9	6.1
Australia	9	9	9	6	6	6	5	5	5	3	2.9	2.6	3.2
Austria	10	9	10	6	5	6	4	4	4	3	3.9	3.6	4.3
Azerbaijan	93	84	103	72	64	81	35	24	50	31	4.4	2.8	6.1
Bahamas	23	22	25	17	16	18	17	13	21	8	1.4	0.4	2.5
Bahrain	23	22	24	13	12	13	10	8	11	8	4.0	3.3	4.8
Bangladesh	144	139	148	88	85	91	41	39	43	48	5.7	5.4	6.0
Barbados	18	17	19	18	17	19	18	15	23	6	-0.2	-1.3	0.9
Belarus	17	16	17	14	14	15	5	5	6	6	5.3	4.8	5.7
Belgium	10	10	10	6	6	6	4	4	5	3	3.9	3.5	4.4
Belize	43	39	49	25	23	27	18	15	22	14	3.9	3.0	4.9
Benin	181	169	192	147	136	160	90	61	126	60	3.2	1.6	4.9
Bhutan	131	116	148	80	72	91	45	33	60	44	4.9	3.5	6.3
Bolivia (Plurinational State of)	123	117	130	78	73	84	41	32	54	41	5.0	3.8	6.2
Bosnia and Herzegovina	18	18	19	10	10	10	7	6	7	6	4.6	4.2	5.0
Botswana	48	42	56	85	66	105	53	22	97	16	-0.5	-3.3	3.9
Brazil	62	57	66	33	30	36	14	13	16	21	6.6	6.1	7.1
Brunei Darussalam	12	12	13	10	9	10	8	7	9	4	2.0	1.2	2.6
Bulgaria	22	22	23	21	21	22	12	12	13	7	2.7	2.5	3.0
Burkina Faso	202	189	214	186	173	200	102	84	124	67	3.1	2.2	4.0
Burundi	164	147	182	150	132	170	104	66	151	55	2.1	0.3	4.2
Cambodia	116	108	126	111	102	120	40	24	71	39	4.9	2.3	7.2
Cameroon	135	125	145	150	138	165	95	61	151	45	1.6	-0.5	3.6
Canada	8	8	8	6	6	6	5	5	6	3	2.0	1.6	2.5
Cape Verde	62	53	70	38	35	41	22	19	26	21	4.6	3.7	5.6
Central African Republic	171	156	189	164	145	186	129	91	184	57	1.3	-0.4	2.9
Chad	209	193	226	189	173	207	150	109	202	70	1.5	0.2	2.9
Chile	19	19	20	11	11	11	9	7	11	6	3.4	2.4	4.4
China	54	50	60	37	35	39	14	12	16	18	6.1	5.4	6.9
Colombia	35	33	38	25	23	27	18	13	24	12	3.1	1.8	4.4
Comoros	124	111	139	99	79	117	78	46	138	41	2.1	-0.6	4.5
Congo	100	85	117	118	105	135	96	62	141	33	0.2	-1.7	2.1
Cook Islands	25	23	28	17	15	20	11	8	14	8	3.9	2.5	5.3
Costa Rica	17	17	17	13	13	14	10	8	12	6	2.4	1.7	3.2
Côte d'Ivoire	152	141	164	145	132	159	108	85	135	51	1.6	0.5	2.7
Croatia	13	13	13	8	8	9	5	4	5	4	4.6	4.3	5.0
Cuba	13	13	14	8	8	9	6	5	6	4	4.0	3.3	4.7

Country or territory	Number of under-five deaths (thousands)						Sex-specific under-five mortality rate (deaths per 1,000 live births)				Infant mortality rate (deaths per 1,000 live births)		Number of infant deaths (thousands)		Neonatal mortality rate (deaths per 1,000 live births)		Number of neonatal deaths (thousands)	
	1990			2012			1990		2012		1990	2012	1990	2012	1990	2012	1990	2012
	Under-five deaths	Lower bound	Upper bound	Under-five deaths	Lower bound	Upper bound	Male	Female	Male	Female								
Afghanistan	96	87	107	103	87	123	180	172	102	95	120	71	66	73	50	36	27	37
Albania	4	3	4	1	0	1	46	39	18	15	37	15	3	1	17	8	2	0
Algeria	41	38	44	20	13	30	54	45	22	18	42	17	34	17	23	12	19	12
Andorra	0	0	0	0	0	0	9	8	4	3	7	3	0	0	2	1	0	0
Angola	106	92	122	148	97	224	223	203	171	156	128	100	64	90	52	45	26	41
Antigua and Barbuda	0	0	0	0	0	0	26	21	11	9	20	9	0	0	12	6	0	0
Argentina	20	20	21	10	10	11	31	24	16	13	24	13	18	9	16	8	12	5
Armenia	4	4	4	1	1	1	54	44	18	15	42	15	3	1	24	10	2	0
Australia	2	2	2	2	1	2	10	8	5	4	8	4	2	1	5	3	1	1
Austria	1	1	1	0	0	0	11	8	4	4	8	3	1	0	5	2	0	0
Azerbaijan	19	17	21	6	4	8	100	85	38	32	74	31	15	5	29	15	6	3
Bahamas	0	0	0	0	0	0	25	21	18	16	20	14	0	0	10	8	0	0
Bahrain	0	0	0	0	0	0	24	22	10	9	20	8	0	0	8	4	0	0
Bangladesh	531	513	550	127	120	134	146	141	44	38	100	33	365	102	54	24	200	76
Barbados	0	0	0	0	0	0	19	16	20	17	16	17	0	0	9	10	0	0
Belarus	3	3	3	1	0	1	19	14	6	5	14	4	2	0	7	3	1	0
Belgium	1	1	1	1	0	1	11	9	5	4	8	3	1	0	5	2	1	0
Belize	0	0	0	0	0	0	47	39	20	16	35	16	0	0	17	9	0	0
Benin	39	37	42	32	21	46	187	173	93	85	109	59	24	21	41	28	9	10
Bhutan	3	2	3	1	0	1	137	125	49	40	92	36	2	1	42	21	1	0
Bolivia (Plurinational State of)	29	28	31	11	8	14	130	117	45	38	85	33	20	9	38	19	9	5
Bosnia and Herzegovina	1	1	1	0	0	0	20	16	7	6	16	6	1	0	11	4	1	0
Botswana	2	2	3	3	1	5	52	44	58	49	38	41	2	2	25	29	1	1
Brazil	219	201	236	42	39	46	68	56	16	13	52	13	180	37	28	9	98	27
Brunei Darussalam	0	0	0	0	0	0	13	11	9	7	9	7	0	0	7	4	0	0
Bulgaria	3	3	3	1	1	1	25	19	13	11	18	11	2	1	12	7	1	0
Burkina Faso	79	73	84	66	54	81	209	193	108	97	102	66	40	43	40	28	16	18
Burundi	43	38	49	43	27	64	173	154	111	98	100	67	27	29	46	36	12	15
Cambodia	40	37	44	14	8	26	124	109	44	35	85	34	28	12	37	18	12	7
Cameroon	69	64	74	74	47	122	142	127	101	89	84	61	43	48	35	28	18	22
Canada	3	3	3	2	2	2	9	7	6	5	7	5	3	2	4	4	2	1
Cape Verde	1	1	1	0	0	0	66	57	25	20	47	19	1	0	21	10	0	0
Central African Republic	20	18	22	19	13	28	178	164	135	122	113	91	13	14	47	41	5	6
Chad	59	54	64	82	59	114	218	199	157	142	114	89	32	50	47	40	13	22
Chile	6	6	6	2	2	3	21	17	10	8	16	8	5	2	8	5	3	1
China	1,647	1,506	1,826	258	225	301	56	52	15	13	42	12	1,315	224	25	9	760	157
Colombia	31	29	34	16	12	22	39	31	20	16	29	15	26	14	20	11	17	10
Comoros	2	2	2	2	1	4	131	117	83	72	87	58	1	1	41	31	1	1
Congo	9	7	10	15	10	23	106	94	101	91	65	62	6	10	33	32	3	5
Cook Islands	0	0	0	0	0	0	28	22	12	9	21	9	0	0	12	6	0	0
Costa Rica	1	1	1	1	1	1	19	15	11	9	14	9	1	1	9	7	1	0
Côte d'Ivoire	73	67	80	75	58	96	163	140	116	99	104	76	51	54	48	40	23	29
Croatia	1	1	1	0	0	0	14	11	5	4	11	4	1	0	8	3	0	0
Cuba	2	2	3	1	0	1	15	11	6	5	11	4	2	0	7	3	1	0

Country or territory	Under-five mortality rate (U5MR) (deaths per 1,000 live births)									Millennium Development Goal target for 2015	Annual rate of reduction (ARR) (percent) 1990–2012		
	1990			2000			2012				ARR	Lower bound	Upper bound
	U5MR	Lower bound	Upper bound	U5MR	Lower bound	Upper bound	U5MR	Lower bound	Upper bound				
Cyprus	11	11	12	7	6	7	3	3	4	4	5.7	4.7	6.6
Czech Republic	15	14	15	7	6	7	4	4	4	5	6.1	5.8	6.5
Democratic People's Republic of Korea	44	34	56	60	47	77	29	22	37	15	1.9	—	—
Democratic Republic of the Congo	171	155	192	171	155	192	146	110	193	57	0.7	-0.4	1.9
Denmark	9	9	9	6	5	6	4	3	4	3	4.0	3.6	4.5
Djibouti	119	100	140	108	89	128	81	49	128	40	1.8	-0.4	4.0
Dominica	17	16	19	16	14	17	13	10	16	6	1.4	0.3	2.5
Dominican Republic	60	56	64	40	37	44	27	20	38	20	3.6	2.1	5.1
Ecuador	56	50	62	34	30	40	23	16	35	19	4.0	2.1	5.7
Egypt	86	82	90	45	42	48	21	20	22	29	6.4	6.1	6.7
El Salvador	59	54	65	32	28	36	16	11	23	20	6.0	4.3	7.6
Equatorial Guinea	182	153	215	143	120	171	100	58	180	61	2.7	-0.1	5.3
Eritrea	150	137	163	89	81	98	52	39	71	50	4.8	3.4	6.2
Estonia	20	20	21	11	11	12	4	3	4	7	7.9	7.2	8.5
Ethiopia	204	190	220	146	135	158	68	52	86	68	5.0	3.9	6.3
Fiji	31	26	36	24	23	26	22	19	26	10	1.4	0.4	2.4
Finland	7	7	7	4	4	4	3	3	3	2	3.8	3.4	4.2
France	9	9	9	5	5	6	4	4	4	3	3.6	3.4	3.9
Gabon	92	81	106	66	75	100	62	48	79	31	1.8	0.5	3.1
Gambia	170	149	195	116	101	135	73	52	100	57	3.8	2.4	5.3
Georgia	35	29	42	34	28	41	20	15	26	12	2.5	1.0	4.1
Germany	9	8	9	5	5	6	4	4	4	3	3.3	3.1	3.6
Ghana	128	121	135	103	96	110	72	56	92	43	2.6	1.5	3.8
Greece	13	12	13	8	8	8	5	4	5	4	4.4	3.9	4.8
Grenada	22	20	24	16	15	17	14	11	17	7	2.2	1.2	3.3
Guatemala	80	75	86	51	45	56	32	23	44	27	4.2	2.7	5.7
Guinea	241	225	257	171	159	183	101	81	122	80	3.9	3.1	5.0
Guinea-Bissau	206	180	235	174	153	200	129	96	171	69	2.1	0.9	3.5
Guyana	60	54	67	46	41	52	35	25	51	20	2.4	0.7	4.1
Haiti	144	136	154	105	98	113	76	66	89	48	2.9	2.2	3.6
Holy See	—	—	—	—	—	—	—	—	—	—	—	—	—
Honduras	59	55	63	38	35	41	23	19	27	20	4.3	3.5	5.1
Hungary	19	19	20	11	11	12	6	6	7	6	5.1	4.6	5.5
Iceland	6	6	7	4	4	5	2	2	3	2	4.7	3.4	6.0
India	126	122	130	92	88	95	56	51	62	42	3.6	3.2	4.1
Indonesia	84	80	88	52	50	55	31	27	36	28	4.5	3.9	5.2
Iran (Islamic Republic of)	56	52	61	35	32	38	18	15	21	19	5.3	4.5	6.2
Iraq	53	49	58	45	41	49	34	29	41	18	2.0	1.1	2.8
Ireland	9	9	10	7	7	8	4	4	5	3	3.8	3.3	4.4
Israel	12	11	12	7	7	7	4	4	5	4	4.6	4.2	5.0
Italy	10	10	10	6	5	6	4	4	4	3	4.3	3.9	4.6
Jamaica	30	25	36	23	20	28	17	12	25	10	2.6	0.8	4.3

Country or territory	Number of under-five deaths (thousands)						Sex-specific under-five mortality rate (deaths per 1,000 live births)				Infant mortality rate (deaths per 1,000 live births)		Number of infant deaths (thousands)		Neonatal mortality rate (deaths per 1,000 live births)		Number of neonatal deaths (thousands)	
	1990			2012			1990		2012		1990	2012	1990	2012	1990	2012	1990	2012
	Under-five deaths	Lower bound	Upper bound	Under-five deaths	Lower bound	Upper bound	Male	Female	Male	Female								
Cyprus	0	0	0	0	0	0	12	10	4	3	10	3	0	0	5	2	0	0
Czech Republic	2	2	2	0	0	0	17	13	4	3	13	3	2	0	9	2	1	0
Democratic People's Republic of Korea	16	12	20	10	8	13	47	40	32	26	33	23	12	8	21	16	7	5
Democratic Republic of the Congo	267	240	302	391	291	531	179	163	154	137	112	100	178	271	47	44	75	118
Denmark	1	1	1	0	0	0	10	8	4	3	7	3	0	0	5	3	0	0
Djibouti	3	3	4	2	1	3	126	112	86	75	93	66	3	2	40	31	1	1
Dominica	0	0	0	0	0	0	19	16	14	12	14	12	0	0	12	9	0	0
Dominican Republic	13	12	13	6	4	8	64	55	30	24	46	23	10	5	27	15	6	3
Ecuador	17	15	19	8	5	12	61	50	26	20	44	20	13	6	20	10	6	3
Egypt	155	147	163	40	38	42	86	85	22	20	63	18	114	35	33	12	59	23
El Salvador	10	9	11	2	2	3	64	54	18	14	46	14	8	2	17	6	3	1
Equatorial Guinea	3	3	4	3	1	5	190	174	106	94	123	72	2	2	47	34	1	1
Eritrea	21	19	23	11	8	16	161	139	57	47	92	37	13	8	35	18	5	4
Estonia	0	0	1	0	0	0	23	18	4	3	17	3	0	0	11	2	0	0
Ethiopia	444	409	483	205	153	259	217	190	74	62	121	47	267	140	54	29	120	88
Fiji	1	1	1	0	0	0	34	27	25	20	26	19	1	0	13	10	0	0
Finland	0	0	0	0	0	0	7	6	3	3	6	2	0	0	4	2	0	0
France	6	6	6	3	3	3	10	8	5	4	7	3	5	3	4	2	2	2
Gabon	3	3	4	3	2	4	99	86	67	57	60	42	2	2	33	25	1	1
Gambia	7	6	8	5	4	7	177	162	78	68	80	49	3	4	46	28	2	2
Georgia	3	3	4	1	1	2	39	30	22	17	30	18	3	1	23	15	2	1
Germany	7	7	7	3	3	3	10	7	5	4	7	3	6	2	4	2	3	2
Ghana	70	66	75	56	43	72	135	121	77	66	80	49	44	38	40	28	22	22
Greece	1	1	1	1	1	1	14	11	5	4	11	4	1	0	9	3	1	0
Grenada	0	0	0	0	0	0	24	20	15	12	18	11	0	0	10	7	0	0
Guatemala	27	25	28	15	11	21	85	75	35	29	60	27	20	12	29	15	10	7
Guinea	64	59	69	41	33	51	248	233	106	96	142	65	38	27	54	34	14	14
Guinea-Bissau	9	7	10	8	6	10	220	191	139	119	122	81	5	5	58	46	2	3
Guyana	1	1	1	1	0	1	67	53	40	31	46	29	1	0	28	19	1	0
Haiti	36	34	39	20	17	24	152	135	82	69	100	57	25	15	37	25	9	7
Holy See	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Honduras	11	10	12	5	4	6	64	54	26	20	48	19	6	4	23	12	4	2
Hungary	3	3	3	1	1	1	21	17	7	6	17	5	3	1	13	4	2	0
Iceland	0	0	0	0	0	0	7	6	3	2	5	2	0	0	3	1	0	0
India	3,325	3,208	3,439	1,414	1,280	1,573	121	130	54	59	88	44	2,333	1,097	51	31	1,354	779
Indonesia	385	367	404	152	131	175	90	77	35	27	62	26	279	125	30	15	134	72
Iran (Islamic Republic of)	107	98	116	26	22	31	57	56	19	17	44	15	82	23	26	11	49	16
Iraq	35	32	38	35	29	42	57	49	38	31	42	28	28	29	26	19	17	19
Ireland	0	0	0	0	0	0	10	8	4	4	8	3	0	0	5	2	0	0
Israel	1	1	1	1	1	1	12	11	5	4	10	3	1	1	6	2	1	0
Italy	5	5	6	2	2	2	11	9	4	4	8	3	5	2	6	2	4	1
Jamaica	2	1	2	1	1	1	34	26	19	15	25	14	1	1	17	11	1	1

Country or territory	Under-five mortality rate (U5MR) (deaths per 1,000 live births)									Millennium Development Goal target for 2015	Annual rate of reduction (ARR) (percent) 1990–2012		
	1990			2000			2012				ARR	Lower bound	Upper bound
	U5MR	Lower bound	Upper bound	U5MR	Lower bound	Upper bound	U5MR	Lower bound	Upper bound				
Japan	6	6	6	5	4	5	3	3	3	2	3.4	3.1	3.6
Jordan	37	34	39	28	26	30	19	16	23	12	3.0	2.1	3.8
Kazakhstan	54	49	60	44	41	49	19	18	20	18	4.8	4.3	5.3
Kenya	98	93	105	110	102	120	73	49	105	33	1.4	-0.3	3.1
Kiribati	94	80	110	71	62	82	60	43	84	31	2.1	0.4	3.7
Kuwait	16	16	17	13	13	13	11	10	12	5	1.8	1.4	2.1
Kyrgyzstan	71	61	81	50	42	56	27	22	30	24	4.4	3.7	5.4
Lao People's Democratic Republic	163	148	180	120	108	134	72	59	87	54	3.7	2.8	4.7
Latvia	20	20	21	17	16	18	9	8	10	7	3.9	3.2	4.5
Lebanon	33	30	37	20	17	23	9	6	15	11	5.7	3.6	7.9
Lesotho	85	77	93	114	103	124	100	76	134	28	-0.7	-2.2	0.5
Liberia	248	227	270	176	161	193	75	56	100	83	5.4	4.1	6.8
Libya	43	36	50	28	27	30	15	13	19	14	4.7	3.5	5.8
Liechtenstein	—	—	—	—	—	—	—	—	—	—	—	—	—
Lithuania	17	16	17	12	11	12	5	5	6	6	5.1	4.7	5.7
Luxembourg	9	8	9	5	4	5	2	2	3	3	6.2	5.0	7.4
Madagascar	159	148	169	109	99	119	58	41	82	53	4.6	3.0	6.2
Malawi	244	230	258	174	162	185	71	56	92	81	5.6	4.4	6.7
Malaysia	17	16	17	10	10	10	9	8	10	6	3.0	2.5	3.6
Maldives	94	86	103	45	41	50	11	9	12	31	10.0	9.3	10.7
Mali	253	238	271	220	205	238	128	91	177	84	3.1	1.7	4.6
Malta	11	11	12	8	7	8	7	6	8	4	2.3	1.5	3.2
Marshall Islands	49	41	58	41	36	48	38	30	48	16	1.2	-0.2	2.6
Mauritania	128	117	139	111	100	122	84	58	122	43	1.9	0.2	3.6
Mauritius	23	22	24	19	18	19	15	13	18	8	1.9	1.2	2.6
Mexico	46	42	51	25	24	27	16	16	17	15	4.8	4.3	5.2
Micronesia (Federated States of)	55	44	70	54	37	79	39	18	78	18	1.6	-1.4	4.8
Monaco	8	7	9	5	5	6	4	3	4	3	3.3	2.5	3.9
Mongolia	107	97	116	63	57	71	28	19	38	36	6.2	4.7	7.8
Montenegro	17	16	18	14	13	14	6	5	7	6	4.8	4.0	5.6
Morocco	80	75	85	50	46	54	31	26	36	27	4.3	3.5	5.1
Mozambique	233	215	251	166	154	179	90	77	106	78	4.3	3.6	5.0
Myanmar	106	96	118	79	72	87	52	39	68	35	3.2	1.9	4.7
Namibia	73	66	80	73	67	81	39	27	55	24	2.9	1.2	4.5
Nauru	58	36	93	42	36	50	37	25	53	19	2.0	-0.9	5.1
Nepal	142	133	151	82	76	88	42	33	52	47	5.6	4.6	6.6
Netherlands	8	8	9	6	6	6	4	4	4	3	3.2	3.0	3.4
New Zealand	11	11	12	7	7	8	6	5	6	4	3.1	2.6	3.5
Nicaragua	66	61	71	40	36	44	24	17	36	22	4.5	2.7	6.3
Niger	326	306	347	227	211	244	114	91	140	109	4.8	3.8	5.8
Nigeria	213	198	227	188	175	201	124	101	151	71	2.5	1.5	3.4
Niue	14	9	21	23	17	32	25	13	46	5	-2.7	-6.1	0.9
Norway	9	8	9	5	5	5	3	2	3	3	5.2	4.6	5.8

Country or territory	Number of under-five deaths (thousands)						Sex-specific under-five mortality rate (deaths per 1,000 live births)				Infant mortality rate (deaths per 1,000 live births)		Number of infant deaths (thousands)		Neonatal mortality rate (deaths per 1,000 live births)		Number of neonatal deaths (thousands)	
	1990			2012			1990		2012		1990	2012	1990	2012	1990	2012	1990	2012
	Under-five deaths	Lower bound	Upper bound	Under-five deaths	Lower bound	Upper bound	Male	Female	Male	Female								
Japan	8	8	8	3	3	3	7	6	3	3	5	2	5	2	3	1	3	1
Jordan	4	4	4	4	3	5	38	35	20	18	30	16	3	3	19	12	2	2
Kazakhstan	21	19	24	6	6	7	61	47	22	16	46	17	18	6	23	10	9	3
Kenya	96	90	102	108	73	158	104	93	78	68	64	49	62	72	33	27	32	40
Kiribati	0	0	0	0	0	0	100	88	65	55	68	46	0	0	29	22	0	0
Kuwait	1	1	1	1	1	1	18	15	12	10	14	10	1	1	9	6	0	0
Kyrgyzstan	10	8	11	4	3	4	77	64	30	23	58	24	8	4	29	14	4	2
Lao People's Democratic Republic	29	26	32	14	11	17	170	155	77	66	112	54	20	10	44	27	8	5
Latvia	1	1	1	0	0	0	23	18	9	8	17	8	1	0	13	5	1	0
Lebanon	2	2	2	1	0	1	34	31	10	9	27	8	2	0	16	5	1	0
Lesotho	5	4	5	6	4	8	91	78	107	92	68	74	4	4	45	45	2	3
Liberia	23	20	25	11	8	15	260	235	80	69	165	56	15	8	51	27	5	4
Libya	5	4	6	2	2	2	47	39	17	14	37	13	4	2	21	9	2	1
Liechtenstein	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lithuania	1	1	1	0	0	0	19	15	6	5	14	4	1	0	9	2	1	0
Luxembourg	0	0	0	0	0	0	10	8	2	2	7	2	0	0	4	1	0	0
Madagascar	80	75	86	44	31	63	166	151	62	54	97	41	52	31	40	22	21	17
Malawi	103	96	110	43	34	57	254	234	76	66	143	46	60	28	50	24	21	15
Malaysia	8	6	9	4	4	5	18	15	9	8	14	7	7	4	8	5	4	2
Maldives	1	1	1	0	0	0	100	86	12	9	68	9	1	0	34	6	0	0
Mali	91	84	98	83	59	118	262	244	134	122	130	80	46	53	59	42	21	28
Malta	0	0	0	0	0	0	12	10	7	6	10	6	0	0	7	5	0	0
Marshall Islands	0	0	0	0	0	0	54	44	42	33	39	31	0	0	19	16	0	0
Mauritania	10	9	11	11	7	16	137	118	92	76	82	65	7	8	43	34	3	4
Mauritius	0	0	0	0	0	0	26	20	17	13	20	13	0	0	16	9	0	0
Mexico	112	101	122	37	36	38	50	42	18	15	37	14	89	32	16	7	40	16
Micronesia (Federated States of)	0	0	0	0	0	0	60	51	42	35	43	31	0	0	21	16	0	0
Monaco	0	0	0	0	0	0	9	7	4	4	6	3	0	0	4	2	0	0
Mongolia	8	7	9	2	1	3	122	91	33	22	76	23	6	2	25	10	2	1
Montenegro	0	0	0	0	0	0	18	16	6	6	15	6	0	0	11	4	0	0
Morocco	56	53	60	23	19	27	85	75	34	28	63	27	44	20	35	18	24	13
Mozambique	132	121	145	84	71	100	241	223	94	85	155	63	87	59	54	30	30	28
Myanmar	117	105	130	48	36	64	114	99	58	47	78	41	81	38	41	26	44	24
Namibia	4	3	4	2	2	3	78	68	43	35	49	28	3	2	29	18	2	1
Nauru	0	0	0	0	0	0	63	53	41	33	45	30	0	0	28	21	0	0
Nepal	95	89	102	24	19	31	143	141	44	39	99	34	66	19	53	24	36	14
Netherlands	2	2	2	1	1	1	9	7	5	4	7	3	1	1	5	3	1	0
New Zealand	1	1	1	0	0	0	13	10	6	5	9	5	1	0	4	3	0	0
Nicaragua	10	9	10	3	2	5	71	61	27	22	50	21	7	3	25	12	4	2
Niger	129	119	139	91	72	113	330	322	117	110	137	63	54	52	48	28	19	23
Nigeria	849	785	916	827	663	1,025	222	203	129	118	126	78	502	528	52	39	207	267
Niue	0	0	0	0	0	0	15	12	28	22	12	21	0	0	7	12	0	0
Norway	1	0	1	0	0	0	10	8	3	3	7	2	0	0	4	2	0	0

Country or territory	Under-five mortality rate (U5MR) (deaths per 1,000 live births)									Millennium Development Goal target for 2015	Annual rate of reduction (ARR) (percent) 1990–2012		
	1990			2000			2012				ARR	Lower bound	Upper bound
	U5MR	Lower bound	Upper bound	U5MR	Lower bound	Upper bound	U5MR	Lower bound	Upper bound				
Oman	39	35	45	17	15	20	12	11	13	13	5.5	4.9	6.3
Pakistan	138	133	144	112	107	117	86	75	100	46	2.2	1.5	2.9
Palau	34	29	39	28	25	33	21	13	32	11	2.2	0.1	4.4
Panama	32	28	35	26	22	30	19	13	27	11	2.4	0.6	4.1
Papua New Guinea	89	80	99	79	68	91	63	43	93	30	1.6	-0.2	3.3
Paraguay	46	41	50	33	29	38	22	16	31	15	3.3	1.7	4.9
Peru	79	75	84	40	37	43	18	15	22	26	6.7	5.7	7.7
Philippines	59	55	63	40	37	44	30	22	42	20	3.1	1.5	4.5
Poland	17	17	18	9	9	10	5	5	5	6	5.7	5.4	6.1
Portugal	15	14	15	7	7	8	4	3	4	5	6.4	6.0	6.7
Qatar	21	19	22	12	12	13	7	6	9	7	4.7	3.9	5.4
Republic of Korea	7	7	7	6	6	6	4	4	4	2	2.8	2.6	3.1
Republic of Moldova	32	27	39	30	24	37	18	13	26	11	2.7	0.8	4.5
Romania	38	37	39	27	26	27	12	11	14	13	5.1	4.5	5.7
Russian Federation	26	26	27	23	23	24	10	10	11	9	4.2	3.9	4.6
Rwanda	151	142	161	182	171	195	55	42	72	50	4.6	3.3	5.8
Saint Kitts and Nevis	29	27	31	18	16	20	9	6	14	10	5.2	3.2	7.2
Saint Lucia	22	21	24	18	17	19	18	13	24	7	1.1	-0.3	2.5
Saint Vincent and the Grenadines	25	23	27	22	21	24	23	19	29	8	0.2	-0.7	1.2
Samoa	30	27	34	22	18	25	18	13	23	10	2.4	1.2	3.8
San Marino	11	9	14	6	4	8	3	2	6	4	5.4	2.4	8.6
Sao Tome and Principe	104	91	119	87	74	101	53	36	81	35	3.0	1.0	4.9
Saudi Arabia	47	39	56	22	20	25	9	8	10	16	7.7	6.6	8.7
Senegal	142	135	149	139	130	149	60	44	80	47	3.9	2.6	5.3
Serbia	28	27	29	13	12	13	7	6	7	9	6.6	6.1	7.0
Seychelles	17	15	18	14	13	15	13	10	17	6	1.1	-0.1	2.2
Sierra Leone	257	235	280	234	212	257	182	137	236	86	1.6	0.4	2.8
Singapore	8	7	8	4	4	4	3	2	3	3	4.4	3.7	5.2
Slovakia	18	17	18	12	12	12	8	7	8	6	3.9	3.6	4.2
Slovenia	10	10	11	6	5	6	3	3	4	3	5.5	4.8	6.0
Solomon Islands	39	33	46	35	29	41	31	20	49	13	1.0	-1.3	3.1
Somalia	177	146	219	171	134	226	147	94	241	59	0.8	-1.0	2.6
South Africa	61	54	69	74	66	83	45	36	56	20	1.4	0.1	2.6
South Sudan	251	208	298	181	154	212	104	72	148	84	4.0	2.1	5.9
Spain	11	11	11	7	6	7	5	4	5	4	4.1	3.7	4.4
Sri Lanka	21	21	22	17	17	18	10	9	11	7	3.6	3.1	4.2
State of Palestine	43	39	47	30	27	33	23	18	29	14	2.9	1.8	4.1
Sudan	128	119	139	106	96	116	73	59	88	43	2.6	1.7	3.5
Suriname	51	42	62	33	26	43	21	12	37	17	4.0	1.5	6.5
Swaziland	71	61	82	121	110	136	80	57	111	24	-0.5	-2.1	1.0
Sweden	7	7	7	4	4	4	3	3	3	2	3.9	3.6	4.3
Switzerland	8	8	9	6	6	6	4	4	5	3	2.9	2.5	3.4
Syrian Arab Republic	38	34	41	24	22	26	15	12	19	13	4.1	3.0	5.1
Tajikistan	105	93	118	91	77	107	58	29	114	35	2.7	-0.4	5.7

Country or territory	Number of under-five deaths (thousands)						Sex-specific under-five mortality rate (deaths per 1,000 live births)				Infant mortality rate (deaths per 1,000 live births)		Number of infant deaths (thousands)		Neonatal mortality rate (deaths per 1,000 live births)		Number of neonatal deaths (thousands)	
	1990			2012			1990		2012		1990	2012	1990	2012	1990	2012	1990	2012
	Under-five deaths	Lower bound	Upper bound	Under-five deaths	Lower bound	Upper bound	Male	Female	Male	Female								
Oman	3	2	3	1	1	1	43	36	13	10	32	10	2	1	18	7	1	1
Pakistan	619	595	646	409	353	477	141	136	90	82	106	69	479	330	56	42	253	202
Palau	0	0	0	0	0	0	38	30	23	19	30	15	0	0	15	10	0	0
Panama	2	2	2	1	1	2	35	28	21	16	26	16	2	1	13	9	1	1
Papua New Guinea	12	11	14	13	9	20	95	83	68	58	65	48	9	10	30	24	4	5
Paraguay	6	6	7	3	2	5	49	42	24	20	36	19	5	3	22	12	3	2
Peru	51	49	55	11	9	13	84	75	20	16	56	14	37	8	28	9	18	6
Philippines	119	111	128	69	49	97	64	53	33	26	41	24	85	54	23	14	47	32
Poland	9	9	9	2	2	2	20	15	5	5	15	4	8	2	11	3	6	1
Portugal	2	2	2	0	0	0	16	13	4	3	12	3	1	0	7	2	1	0
Qatar	0	0	0	0	0	0	22	19	8	7	18	6	0	0	10	4	0	0
Republic of Korea	4	4	4	2	2	2	7	7	4	4	6	3	3	2	3	2	2	1
Republic of Moldova	3	2	3	1	1	1	36	28	20	16	27	15	2	1	14	9	1	0
Romania	16	16	17	3	2	3	42	34	14	11	31	11	14	2	18	8	8	2
Russian Federation	59	58	60	17	16	18	30	22	12	9	22	9	49	15	14	6	32	9
Rwanda	49	46	53	24	18	31	159	143	59	51	92	39	30	17	38	21	13	9
Saint Kitts and Nevis	0	0	0	0	0	0	32	26	10	8	23	7	0	0	18	7	0	0
Saint Lucia	0	0	0	0	0	0	25	20	19	16	18	15	0	0	13	10	0	0
Saint Vincent and the Grenadines	0	0	0	0	0	0	27	23	25	21	21	21	0	0	15	15	0	0
Samoa	0	0	0	0	0	0	33	28	19	16	25	15	0	0	11	7	0	0
San Marino	0	0	0	0	0	0	12	10	4	3	10	3	0	0	5	1	0	0
Sao Tome and Principe	0	0	0	0	0	1	110	98	58	49	67	38	0	0	31	20	0	0
Saudi Arabia	26	21	31	5	4	6	50	43	9	8	37	7	20	4	21	5	12	3
Senegal	44	42	47	30	22	40	148	135	65	55	71	45	22	23	41	24	13	12
Serbia	4	4	4	1	1	1	30	26	7	6	24	6	4	1	17	4	3	0
Seychelles	0	0	0	0	0	0	18	15	14	12	14	11	0	0	10	8	0	0
Sierra Leone	44	40	49	39	29	52	289	246	190	173	153	117	26	25	59	50	10	10
Singapore	0	0	0	0	0	0	8	7	3	3	6	2	0	0	4	1	0	0
Slovakia	1	1	2	0	0	0	20	16	8	7	16	6	1	0	12	4	1	0
Slovenia	0	0	0	0	0	0	11	9	3	3	9	3	0	0	6	2	0	0
Solomon Islands	0	0	1	1	0	1	42	35	34	28	31	26	0	0	16	14	0	0
Somalia	50	40	63	65	40	112	185	169	154	141	107	91	31	40	50	46	15	20
South Africa	65	57	74	50	40	63	67	55	49	40	47	33	50	37	21	15	22	17
South Sudan	66	53	81	40	27	58	262	241	109	98	149	67	40	26	57	36	15	14
Spain	5	4	5	2	2	2	12	10	5	4	9	4	4	2	7	3	3	1
Sri Lanka	7	7	7	4	3	4	23	20	10	9	18	8	6	3	13	6	4	2
State of Palestine	4	3	4	3	2	4	45	40	24	21	35	19	3	2	21	13	2	2
Sudan	101	93	110	89	71	108	136	120	79	67	80	49	64	60	40	29	32	35
Suriname	0	0	1	0	0	0	56	45	23	18	43	19	0	0	23	12	0	0
Swaziland	3	2	3	3	2	4	76	66	85	75	54	56	2	2	29	30	1	1
Sweden	1	1	1	0	0	0	8	6	3	3	6	2	1	0	4	2	0	0
Switzerland	1	1	1	0	0	0	9	7	5	4	7	4	1	0	4	3	0	0
Syrian Arab Republic	17	15	18	8	7	10	41	34	17	14	31	12	14	7	18	9	8	5
Tajikistan	23	20	26	15	8	31	113	96	64	52	82	49	18	13	33	23	7	6

Country or territory	Under-five mortality rate (USMR) (deaths per 1,000 live births)									Millennium Development Goal target for 2015	Annual rate of reduction (ARR) (percent) 1990–2012		
	1990			2000			2012				ARR	Lower bound	Upper bound
	USMR	Lower bound	Upper bound	USMR	Lower bound	Upper bound	USMR	Lower bound	Upper bound				
Thailand	38	36	41	23	20	26	13	9	19	13	4.8	3.2	6.5
The former Yugoslav Republic of Macedonia	37	35	38	16	15	17	7	6	9	12	7.3	6.6	8.0
Timor-Leste	171	155	188	106	96	117	57	41	75	57	5.0	3.7	6.5
Togo	143	133	155	122	110	135	96	73	125	48	1.8	0.7	3.0
Tonga	23	19	28	18	13	24	13	7	22	8	2.6	0.2	4.9
Trinidad and Tobago	33	28	39	28	22	36	21	12	36	11	2.1	-0.3	4.5
Tunisia	51	45	58	30	25	35	16	14	19	17	5.3	4.2	6.3
Turkey	74	69	79	37	33	42	14	10	21	25	7.5	5.7	9.3
Turkmenistan	90	78	103	79	67	93	53	29	90	30	2.4	0.1	5.1
Tuvalu	58	49	68	42	38	47	30	21	44	19	3.0	1.0	4.9
Uganda	178	168	189	147	138	157	69	57	84	59	4.3	3.4	5.2
Ukraine	20	18	23	19	17	21	11	10	12	7	2.8	2.1	3.5
United Arab Emirates	17	14	20	11	11	12	8	7	10	6	3.2	2.2	4.0
United Kingdom	9	9	10	7	6	7	5	5	5	3	3.0	2.8	3.3
United Republic of Tanzania	166	157	177	132	123	141	54	41	71	55	5.1	3.9	6.3
United States	11	11	11	8	8	9	7	6	8	4	2.1	1.4	2.7
Uruguay	23	22	24	16	16	17	7	5	10	8	5.3	3.7	7.0
Uzbekistan	74	64	84	61	53	71	40	21	67	25	2.8	0.5	5.6
Vanuatu	35	29	42	24	19	33	18	10	33	12	3.0	0.3	5.8
Venezuela (Bolivarian Republic of)	30	29	30	21	21	22	15	14	17	10	3.0	2.6	3.4
Viet Nam	51	46	55	32	29	34	23	22	24	17	3.6	3.1	4.0
Yemen	125	117	134	97	89	105	60	42	85	42	3.3	1.8	5.0
Zambia	192	180	205	169	156	183	89	60	140	64	3.5	1.4	5.3
Zimbabwe	74	68	80	102	92	113	90	70	120	25	-0.9	-2.3	0.3

Table 8: Country, regional and global estimates of under-five, infant and neonatal mortality⁴⁴

⁴⁴ (UN Inter-agency Group on Child Mortality Estimation, 2013)

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