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Using Economic Evaluation to Strengthen Public Health Supply Chains

USAID | DELIVER PROJECT 2009

A logistics worker processes inventory information in Mozambique, where a cost-benefit analysis revealed the significant savings generated by switching from a traditional to a dedicated vaccine logistics system.

Economic evaluation can help decisionmakers make informed choices about the best way to strengthen and improve the performance of public health supply chains in developing countries.

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Cost benefit. Cost effectiveness. Return on investment. Value for money.

These analyses, common in the commercial world, are applied to supply chains throughout the private sector. Development partners and government decisionmakers increasingly use these analyses to determine if their investments to support and strengthen public health supply chains are having a positive impact. But, what do these terms really mean? How can the tools of economic evaluation inform supply chain decisions and improve not only commodity availability, but also quality, affordability, and accessibility?

The money invested to improve supply chain performance can have an immediate impact, long-term impact, or both; the ultimate results are more accessible, higher-quality, and affordable products and services; and better health outcomes. However, funds for strengthening health systems are limited, and there are ample reasons to invest in other health system components.

When considering whether, how, and how much to invest in strengthening supply chains, decisionmakers face many questions: How much should we invest in supply chain strengthening versus information systems, service delivery, human resources, or leadership and governance? What is the most efficient way to organize our distribution system? Should we outsource key supply chain functions—for example, transport or warehousing—to the private sector? Are the expected savings and performance improvements worth the cost of introducing a pay-for-performance approach?

These questions address how to use scarce healthcare resources. An economic evaluation can be one way to answer these questions—it can help decisionmakers make informed choices about the best way to strengthen and improve the performance of public health supply chains in developing countries. The USAID |

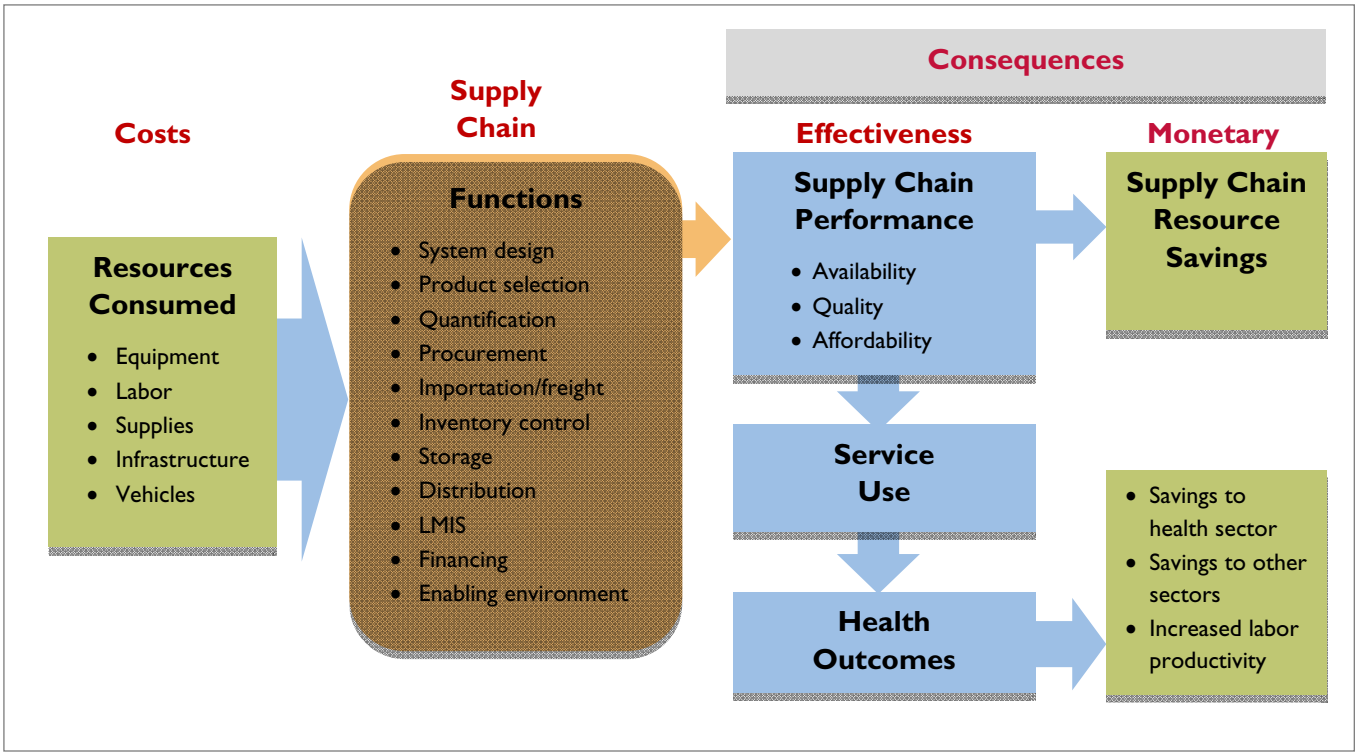
DELIVER PROJECT conducted similar evaluations in a number of countries; the process and case studies are documented in the guide, Economic Evaluation: Guide to Approaches for Public Health Supply Chains.

Types of Economic Evaluation

Economic evaluation compares both the *costs* and the *consequences* of alternative courses of action as a way to guide decisions about the efficient use of scarce resources. Figure 1 illustrates how we can apply this thinking to public health supply chains by looking at these basic components:

- The *costs* of a supply chain investment in resources—equipment, labor, supplies, infrastructure, vehicles, etc.
- The *functions* of the supply chain that consume these resources.
- The *consequences* of a strengthening activity—the effectiveness, as measured by supply chain performance, use of health services, and health outcomes.
- The *monetary benefits* generated through savings on, or the more efficient use of the resources used in supply chain operations; or improvements in health outcomes that result in savings for the health system, savings to other sectors, or increased labor productivity.

Figure 1. Components of Economic Evaluation of Supply Chains



Economic evaluation includes two broad categories of analysis: *cost-effectiveness analysis* and *cost-benefit analysis,* sometimes referred to as *return on investment analysis*.

Cost-Effectiveness Analysis

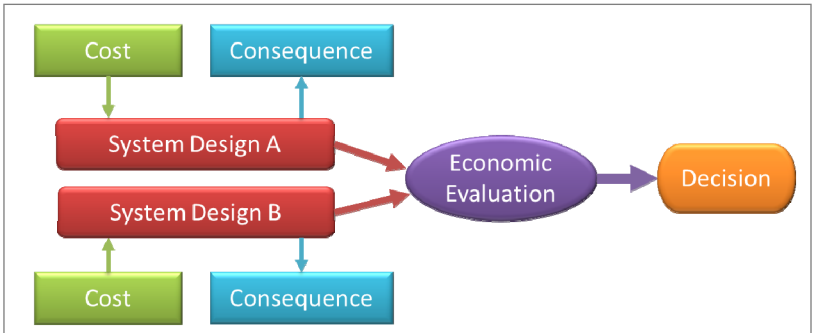
A cost-effectiveness analysis relates the costs of different approaches to a common measure of supply chain effectiveness, such as stock status, order fill rate, or a composite performance measure. The analysis might consider broader measures that relate supply chain performance to service use, such as couple-years of

protection (CYP), children vaccinated, or clients treated or tested. Or, it might suggest a relationship between use of services and one or more health outcomes, such as births averted, deaths averted, or disability-adjusted life years (DALYs) averted. However, because of many other contributing factors, it is difficult to show a causal relationship between supply chain performance and health outcomes.

A cost-effectiveness analysis helps answer a number of questions: What is the relative efficiency of one supply chain intervention over another in terms of achieving a level of supply chain performance, service use, or health outcome? Are investments in supply chains, or in other health systems building blocks, the most efficient way to achieve a particular health outcome?

Figure 2 illustrates how a comparison of costs and consequences of two alternative system designs can be the basis for a decision.

Figure 2. Cost-Effectiveness Comparison between Alternate Supply Chain System Designs



(Adapted from CDC 2013)

To make informed choices, decisionmakers need to know the costs that each function or intervention will require, as well as the consequences (effectiveness) that result.

A cost-effectiveness analysis has been used in a number of countries to inform decisions about supply chain interventions. For example, in *Zambia* the cost effectiveness of the existing (standard) distribution system for essential drugs, which involved the central allocation of kits without consumption data, was compared to two models that rely on orders from service delivery points (SDPs). Model A requires district aggregation of orders and the delivery of an aggregated consignment to the district; while model B requires that the central level packs SDP consignments, which are delivered to districts for onward distribution. The costs included the incremental (additional) costs of labor, communication, commodity transport, administration, and training; while the effectiveness was measured in terms of stock availability of 15 tracer items, use of malaria services and malaria deaths, and DALYs averted.

Table 1. Zambia: Cost Effectiveness of Alternative Essential Medicines Supply Chains

Model	District Monthly Supply Chain Cost ($)	Average Stock Availability (%)	Average Cost Effectiveness Rate ($)	Incremental Cost Effectiveness Rate ($)
Standard	3,878	79	49	N/A
A	7,357	82	90	14.50
B	7,849	91	86	4.18

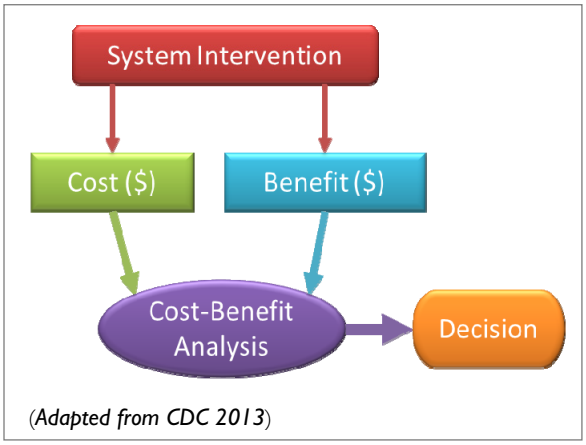
As seen in table 1, model B was the most costly but produced 91 percent stock availability for an average of $86 per percentage point of stock availability. The incremental costs were less then model A, which was slightly less expensive than model B on a monthly basis, but produced only 82 percent stock availability. The significant improvement in performance justified the decision to change to distribution model B (World Bank 2010; Zambia Logistics Steering Committee 2011).

Cost-Benefit Analysis

The second major category of economic evaluation is a cost-benefit analysis (CBA). Similar to a cost-effectiveness analysis, a CBA measures costs and consequences of alternative approaches, but in monetary terms. These benefits can include savings to the supply chain that result from better system performance, such as lower drug costs when inventory is reduced, fewer expired or spoiled products, or lower transportation and/or labor costs. The benefits might also include savings from better health outcomes, such as health costs averted when CYP increases.

A cost-benefit analysis helps answer questions that include—What are the projected monetary savings from undertaking a specific intervention? Which supply chain investment provides the greatest economic benefit? How do the economic benefits of supply chain investments compare with investments in other health systems building blocks, or in other sectors outside health?

Figure 3. Cost-Benefit Analysis of a Supply Chain Investment

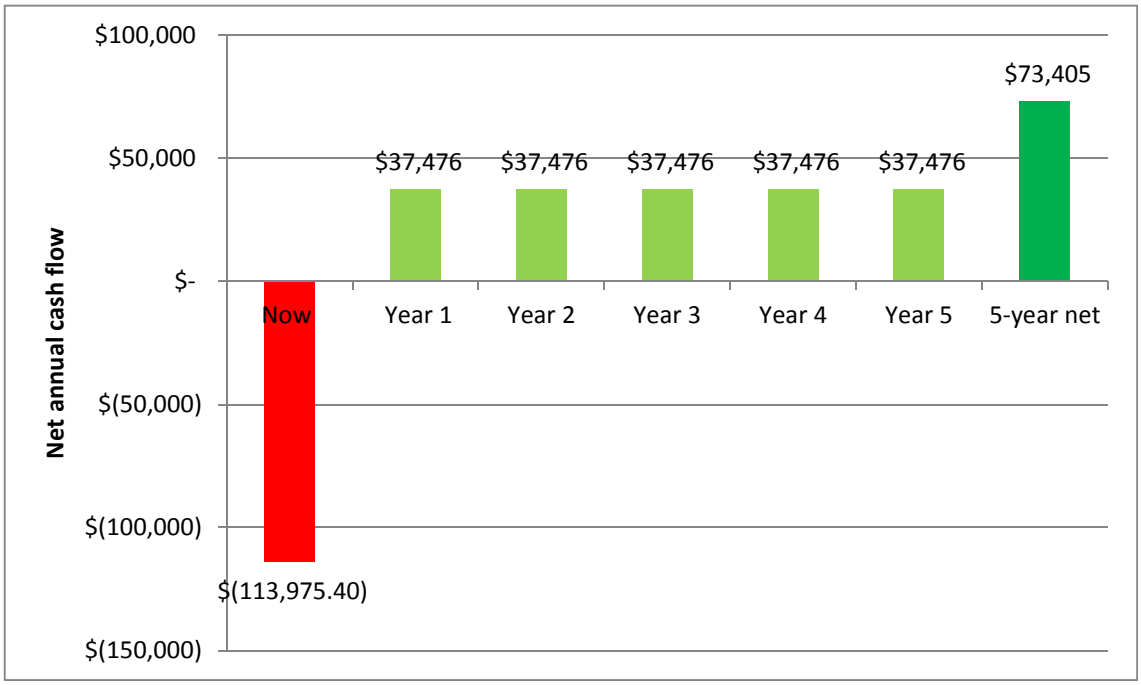


(*Adapted from CDC 2013*)

Figure 3 illustrates the cost-benefit analysis of an investment in a supply chain strengthening intervention. The costs are the monetary inputs required—for example, software development and systems implementation, hardware, and training; and could also include maintenance and administration for an electronic logistics management information system (eLMIS). The benefit is the monetary value that results from the investments; in the case of an eLMIS, improved data transparency would reduce expiries and inventory levels, and result in long-term quantifiable savings. To justify the investment, the long-term savings (benefit) must be significantly higher than the short-term investment and operating costs. This can be simplified into a benefit-cost ratio, such as 2.5:1, when the benefit is 2.5 times higher than the cost over a specific period of time.

A cost-benefit analysis of supply chain interventions was done to consider questions about outsourcing commodity transport and the impact of increasing investments in family planning commodities. In *Mozambique*, a CBA compared the costs and monetary benefits of a pilot project for a dedicated vaccine logistics system with established schedules and monthly delivery. The annual running costs under the existing ad hoc system are $266,563 versus $229,087 under the pilot model; this is a yearly savings of $37,476. In addition, switching to the new model required an initial investment of $113, 975 for vehicles. The savings over five years was a cumulative gain of $187,380; which, after subtracting the initial $114,000 investment, equals a total five-year net cash flow of $73,405 (see figure 4). This represents a benefit-cost ratio of 1.64:1, or a 64 percent five-year return on investment.

Figure 4. Mozambique–Net Cash Flow after Changing from Traditional to Dedicated Logistics System



In a cost-effectiveness analysis of a pilot project, sites in the traditional system reported 67 percent vaccine stock availability versus 99 percent served in the new dedicated system. Switching from the traditional to the new model will increase performance and save on annual running costs. After three years, the initial investment in vehicles for the new system will result in net savings for the Ministry of Health. After five years, net gains will be significant.

Conclusion

The cost effectiveness or cost benefit of a particular intervention is one of many factors decisionmakers must consider when selecting different supply chain interventions. Other important factors include human resource capacity needed to carry out an intervention, long-term financial and technical sustainability, and political or social consequences of choosing one option over another. Nevertheless, economic evaluation can provide important additional information about the cost and consequences of a particular approach to supply chain strengthening, and it can help focus attention on fundamental considerations for better-informed decisionmaking.

Chris Wright wrote this brief, drawing primarily on *Economic Evaluation: Guide to Approaches for Public Health Supply Chains* (Rosen 2014), which includes several examples of CEA and CBA. That guide can be found on the USAID | DELIVER PROJECT website here:

http://deliver.jsi.com/dhome/resources/allpubs/guidelines/EvalEconGuid.pdf

References and Additional Reading

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For more information on economic evaluation and supply chain costing, go to—

http://deliver.jsi.com/dhome/whatwedo/commsecurity/csfinancing/cssupplychaincosting

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