



Risk Management for Public Health Supply Chains

Toolkit for Identifying, Analyzing, and Responding to Supply Chain Risk in Developing Countries



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USAID | DELIVER PROJECT, Task Order 4

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Abstract

When the term *risk management* is mentioned, most people immediately think about how unexpected events, like hurricanes and tsunamis, can affect supply chain operations. But, the concept of risk management is much broader than this. Whereas unexpected events often have detrimental effects for supply chain operations, they are not the sole focus of risk management. Risk management for public health supply chains focuses on how to organize the logistics activities of the supply chain in order to ensure that commodities needed for health programs are continuously available, without disruption. The USAID | DELIVER PROJECT, Task Order 4, developed this toolkit to introduce risk management activities for health programs in developing countries.

Risk management is not limited to a single occasion. It is a continuous process of assessing and responding to risk within the supply chain. This toolkit can provide public health supply chain managers in developing countries with a simple process for identifying and analyzing the sources of risk within the supply chain and for developing a robust response to manage risk. In this toolkit, you will find—

- two case studies describing how risk management has been successfully used in a resource-limited setting
- a short facilitator's guide that the supply chain manager can use to lead stakeholders through a risk management workshop for a health program
- the Risk Assessment and Control (TRAC) spreadsheet that can be used to analyze supply chain risk and to select appropriate responses.

The authors hope that you will use this toolkit to structure supply chain operations for your program around a risk management approach. For questions and comments, please contact the USAID | DELIVER PROJECT at askdeliver@jsi.com. You can also contact the authors directly.

Cover photo: Fire fighters putting out a fire at a medical supplies warehouse. (source: creativecommons.org)

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Introduction to Risk Management for Public Health Supply Chains

All activities and operations conducted in a public health supply chain are exposed to risk. In each supply chain, on a daily basis, numerous staff work in procurement, storage, distribution, inventory management, and reporting—all to ensure that clients and patients in public health facilities receive the products they need. Many potential problems can interrupt these activities and the ability to provide products to clients—these are known as supply chain risks. For example, sudden reduction in funding may limit procurement or slow down delivery operations. Poorly trained staff may request the wrong amount of products. Natural disasters may interrupt distribution channels. Public health supply chain managers must, therefore, be able to manage risk.

To manage risk, organizations first identify the types and sources of the risks then analyze the impact and likelihood of these risks occurring; and, finally, implement interventions to mitigate the risk so that it does not occur, or so that the impact does not significantly hamper the supply chain operations.

While all supply chain managers have informal ways to deal with risk, this toolkit presents a number of principles for formalizing and strengthening the risk management process. Risk management principles can be applied to the entire supply chain—at its many levels—at any time—or to specific functions or activities within the supply chain.

What Is Risk Management?

Risk management is a formal approach used to identify and mitigate the sources of disruption and dysfunction within the public health supply chain. To fully understand the value that a comprehensive risk management approach can bring to a public health supply chain, we must first define a few key terms. A risk management system comprises a number of activities, as shown in table 1.

Table 1. Risk Management Activities

Risk Management Activity	Definition
Risk context	Mapping supply chain, health, funding, and customer systems
Risk evaluation	Determining critical features of the risks in the supply chain to inform risk management
Risk mitigation	Determining risk treatment strategy: reducing or avoiding risk, developing contingency plans
Incidence handling	Executing contingency plans
Risk performance monitoring & learning	Monitoring supply chain performance to improve approaches

Risk context refers to the circumstances in which a supply chain operates. Analyzing the risk context is important for determining how stakeholders and institutions expose the supply chain to risk.

Risk evaluation is the process of identifying the risk events on which follow-up risk management activities should focus. Here, risk events are usually evaluated in terms of likelihood and impact on the supply chain; and the additional features that suggest the more appropriate response to the risk event.

Risk mitigation is the process of determining the appropriate set of responses for each of the risk events identified and prioritize them using the risk evaluation approach. In general, risk responses can be categorized into four types—(1) hedging, (2) reducing, (3) avoiding, and (4) accepting—and they are usually selected based on the features of the risk events.

Risk monitoring is the process of watching drivers and indicators of the risk event in order to provide advanced notice of impending events. This notice can help reduce the impact of the events or reduce the likelihood of reoccurrence.

Incidence handling is the process of executing contingency plans when a risk event occurs.

Risk performance monitoring and learning is the process of identifying performance metrics that can be used to track the benefits of risk management approaches. In many cases, these metrics can be chosen from the existing set of supply chain metrics; while, in some cases, new metrics may need to be created. As with general performance measurement, metric monitoring should be coupled with the application of learning principles to improve the risk management approach, over time.

Benefits of Risk Management

Why use a risk management approach for supply chain operations? The benefits of risk management are listed in box 1. Health programs in developing countries are facing increasingly diverse challenges. For instance, both the number of patients and the breadth of services offered by health programs have rapidly expanded. Public health supply chains must provide an increasing quantity and variety of commodities that are sourced from all over the world. Consequently, opportunities for the system to break down increase, and consequences are greater when it does.

How does risk management create and protect value for the health program? Risk management can help organizations safeguard the quality and supply of health commodities for customers. It anticipates hazards and controls risk using an ongoing process of risk awareness, reduction, or acceptance. This approach can help justify improvements and investments, where needed. Over time, supply chain managers who incorporate a risk management approach in their work can reduce costs and improve the efficiency of operations. Another benefit of using a risk management approach is that it brings stakeholders together and improves coordination. As risks in the supply chain are analyzed and communicated among stakeholders, all parties can be made aware of their vital contributions and how they can best improve performance. This is a good platform for improving the supply chain's governance and leadership. Proactive risk management can also build avenues for trust and collaboration between stakeholders.

Box 1. Risk Management Can Provide the Following Benefits

- increase the likelihood of achieving the supply chain objectives
- reduce costs and improve the overall efficiency of the supply chain operations
- improve the governance and leadership of the supply chain
- improve customer and stakeholder confidence and trust in the supply chain
- focus the supply chain manager on proactively managing risk, not only reacting to unforeseen events

Implementing Risk Management

The level of effort invested by the health program in supply chain risk management will vary from program to program; and it should be commensurate with the level of prevailing risk. For successful implementation, the following are key foundations:

- Ensure top level management support and commitment.
- Structure the risk management process simply and avoid complexity.
- To ensure that risk management will, eventually, be embedded in the culture of the health program, all stakeholders should be ready to learn and evolve as they go through the process.

Risk Management Process

This section briefly describes the steps needed to identify, monitor, and control risk (see figure 1). Introducing risk management requires strong, sustained commitment by the management of the health program, as well as strategic and rigorous planning at all levels. Prior to risk management, partners should identify an inclusive leadership structure that will be responsible and accountable for the process. All relevant stakeholders should be represented in this structure, or they should be given the opportunity to contribute to its leadership.

Step I: Risk Context

As shown in figure 1, the risk management process begins with understanding the context of the health program. For any risk management process to be effective, it must be tailored to the unique needs and circumstances of the particular health program. The following questions can help define the context:

- What are the objectives of the health program? What are the key drivers and trends that may impact the program’s objectives?
- What is the relationship between the health program and the stakeholders?
- What are the social, political, legal, regulatory, and financial influences or obligations of the health program?

Figure 1. Risk Management Process

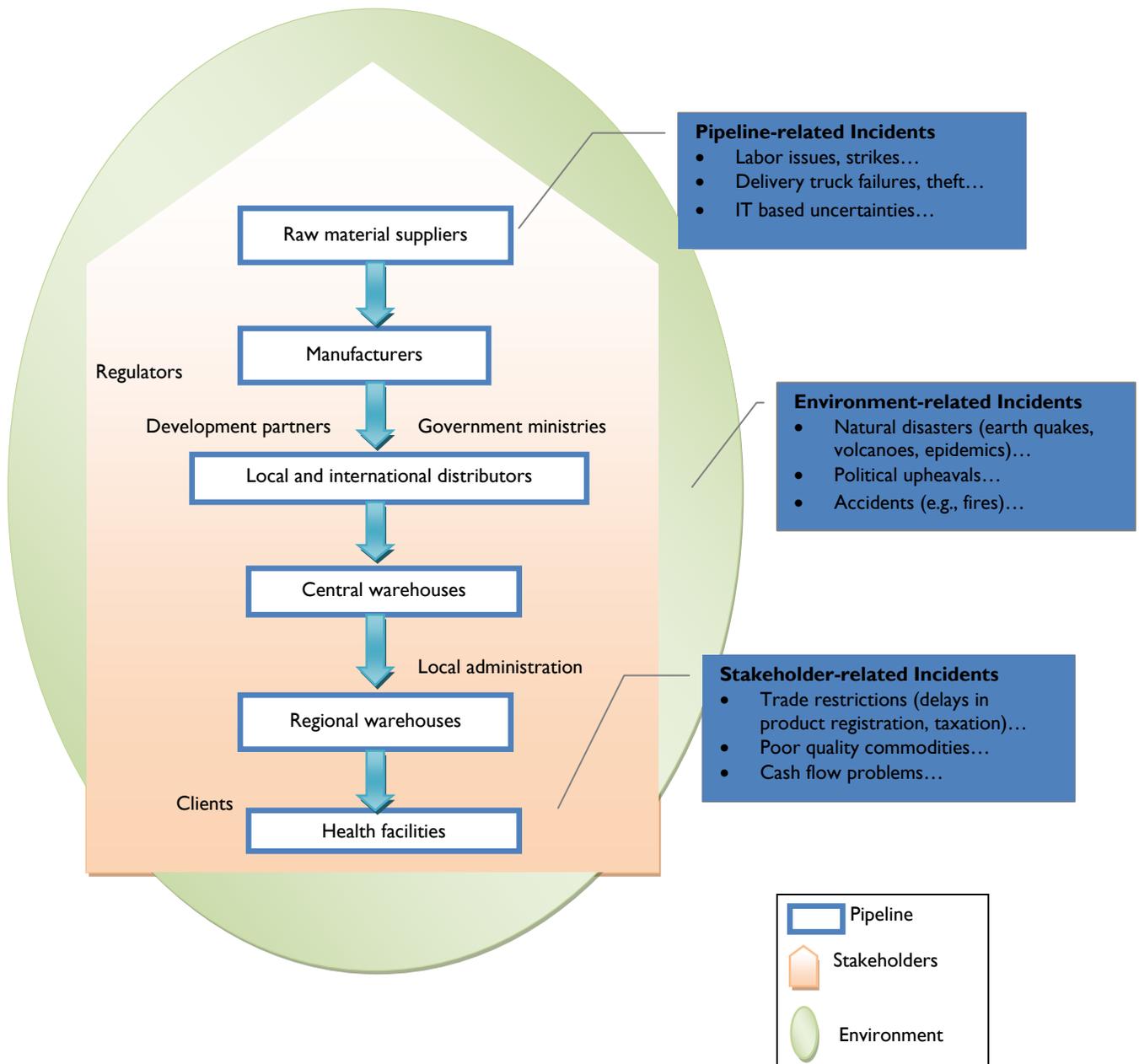


Stakeholders that represent various operating functions, and health system organizations, should be involved in all steps because they offer a perspective on impact and the drivers of risk events. In some cases, stakeholders are necessary for implementing certain risk strategies.

Step 2: Risk Evaluation

The risk evaluation step is next. Supply chain managers may consider using [The Risk Assessment and Control Decision Support Tool](#) (TRAC-DST) dashboard developed for this toolkit. This step begins by developing a list of possible risks to the supply chain, examining the influences of both internal and external factors on the supply chain operations. Any public health supply chain has an inexhaustible number of risks; therefore, categorizing these events may be useful. One way is illustrated in figure 2.

Figure 2. Areas to Examine for Sources of Supply Chain Risk



Major supply chain incidents may occur within the organizations that form the pipeline for the health program's commodities; generally, in three ways:

1. *Within the health commodity pipeline*, i.e., among the organizations that are part of the health program's supply chain: theft of commodities in transit, labor disputes, production failures at the manufacturers, breakdown of communications and information technology.
2. *Among the stakeholders that interact with the supply chain*: withdrawal of donor funding, trade restrictions imposed by local and international regulators, and counterfeit medicine.
3. *Outside the environment of the supply chain and stakeholders*: natural disasters, political unrest, and disease outbreaks.

From these operational areas, it is clear that a risk event may have multiple effects across different operational areas. A tabulation of these two dimensions, as shown in figure 3, can help identify these risk events.

Figure 3. Sample Grid for Determining the Risk Events in Public Health Supply Chains

		Operational Areas			
		Inventory Logistics	Funding	Health Systems	Patient-related
Fundamental Sources of Risk	Source A				
	:				
	:				
	:				
	:				
	Source H				



The next step is to assess important attributes of the risks that prevail in the supply chain in order to select an appropriate strategy; see box 2. To ensure a consistent assessment, it is necessary to explicitly interpret the likelihood and impact for each risk event. The TRAC dashboard uses a scale of 1 to 4. See table 2 for examples of the interpretation of this scale. The impact should be rated

based on the potential effect of the risk event on the objectives of the health program. The maximum score should correspond to a complete breakdown of supply chain operations. Likelihood can be based on the frequency over a specified time (e.g., one year or one month).

Critical Number

The impact and likelihood ratings can now be used to calculate a critical number. The formula is—

$$\text{Critical number} = \text{Impact rating} \times \text{Likelihood rating}$$

The critical number scale will range from 1 to 16. Risk events can then be ranked using this critical number, with the higher rank being the higher priority. The TRAC dashboard has many graphs that can guide this prioritization process.

Box 2. Five Features of Risk Events Used to Select a Risk Treatment Strategy

- *Impact*: The extent of the negative effect of the event on supply chain operations.
- *Likelihood*: The frequency with which this event is expected to occur.
- *Controllable*: The extent to which the source of risk is under the control of the supply chain manager and their team.
- *Structural*: The extent to which risk events arise from the design of the health supply chain systems and the strategic relationships between decisionmakers and actors.
- *Operational*: The extent to which risk events arise from supply chain decisionmaking and activities.

Table 2. Example of Scale Interpretations for Impact of Risk Events

Scale Response	Interpretation
1	Less than 3 days of supply chain operations disruption
2	From 4 days to 1 week of supply chain operations disruption
3	More than 1 week to 1 month of supply chain operations disruption
4	More than 1 month of supply chain operations disruption

Table 3. Example of Scale Interpretations for Likelihood of Risk Events

Scale Response	Interpretation
1	Once during every 5 years
2	Once every 3 – 5 years
3	Once every 1 – 3 years
4	Once a year or more often

Controllable Attributes of Risk Events

The controllable attribute of a risk event is whether the drivers of risk are manageable given the capabilities of the supply chain manager and the resources available to the health program. A scaled response of this attribute is shown in table 4.

Table 4. Example of Scale Interpretations for Controllable Attributes of Risk Events

Scale Response	Interpretation
1	The supply chain manager and her team <i>have no control</i> of the source of risk.
2	The source of risk is <i>primarily not</i> under the control of the supply chain manager and her team.
3	The source of risk is <i>primarily</i> under the control of the supply chain manager and her team.
4	The source of risk is <i>completely</i> under the control of the supply chain manager and her team.

Structural Attributes of Risk Events

The structural attribute of a risk event is the extent to which the risk event is caused by the design of the supply chain and the strategic relationships between decisionmakers. A scaled rating of structural attributes of risk is shown in table 4.

Table 5. Example of Scale Interpretations for Structural Attributes of Risk Events

Scale Response	Interpretation
1	The risk event <i>does not arise at all</i> from the design of the health supply chain systems and the strategic relationships between decisionmakers and actors.
2	<i>Primarily, the risk event does not arise</i> from the design of the health supply chain systems and the strategic relationships between decisionmakers and actors.
3	The risk event <i>results primarily</i> from the design of the health supply chain systems and the strategic relationships between the decisionmakers and actors.
4	The risk event <i>arises completely</i> from the design of the health supply chain systems and the strategic relationships between decisionmakers and actors.

Operational Attributes of Risk Events

The definition of the operational risk event feature is the extent to which risk events are caused by supply chain decisionmaking and activities. See table 5.

Table 6. Example of Scale Interpretations for Operational Attributes of Risk Events

Scale Response	Interpretation
1	The risk event <i>does not arise at all</i> from supply chain decisionmaking and activities.
2	<i>Primarily, the risk event does not arise</i> from supply chain decisionmaking and activities.
3	The risk event <i>arises primarily</i> from supply chain decisionmaking and activities.
4	The risk event <i>arises completely</i> from supply chain decisionmaking and activities.

Step 3: Risk Treatment

In this step, an appropriate response is selected and implemented to mitigate the risks to the supply chain. Risk treatment either prevents the risk event from occurring, or it reduces the impact of risk events on the supply chain operations.

Both the senior leadership of the health program and the members of the risk management team with the necessary technical competencies, are responsible for selecting a risk treatment strategy. Also, stakeholder participation in this process is important to ensure collective acceptance. When risks have been evaluated as requiring action, a decision has to be made as to whether or not—

- the health program and stakeholders require each risk to be controlled
- it is feasible for the health program to technically, safely, and economically reduce each of the risks
- new risks might be introduced as a result of attempts to control the current risks.

Generally, there are four types of responses to supply chain risk:

- accepting risk
- avoiding risk
- reducing risk
- hedging risk.

Accepting Risk

Risk acceptance is a deliberate decision to take no action on the identified risk (see box 3). Instead, efforts of the risk management team focus more on developing a contingency plan to minimize disruption to the supply chain if the risk event occurs. A key part of risk acceptance is formally recording the decision by management and communicating this to all health program managers and relevant stakeholders. Being aware of these risks enables the health program to monitor the situation and be prepared to respond appropriately if the situation changes.

Box 3. Reasons a Health Program May Accept Supply Chain Risks

- There is no practical way to treat the risk right now.
- There is no added value at this time, based on prioritization.
- The risk will be eliminated due to upcoming improvements in other areas of the supply chain.

Avoiding Risk

Avoiding risk refers to approaches that reduce the *likelihood* of risk events occurring by changing the dynamics of the supply chain (see box 4). For instance, the supply chain can be redesigned by removing an entire level to reduce the likelihood that commodities will be damaged during storage at that level. Also, to avoid the risk of commodities being delayed due to long international procurement procedures, a health program may decide to procure the bulk of its commodities from local suppliers.

Box 4. Examples of Strategies to Avoid Supply Chain Risk

- Redesign the supply chain network.
- Shift the tasks to other parties, e.g., outsourcing transportation.
- Address incentive misalignment.
- Select medicines and health commodities with fewer supply chain risks.

Reducing Risk

Reducing risks to the supply chain refers to approaches that limit the *consequences* of risk events by focusing on the underlying causes of the risk (see box 5). Typical examples include all the efforts made to integrate the supply chain. For example, to reduce dependence on external partners for training needs, the health program might engage local institutions to provide training and expertise in supply chain management. Also, a health program can protect itself from fluctuating prices by using framework contracts to negotiate fixed prices with suppliers, over an extended time.

Box 5. Examples of Strategies to Reduce Supply Chain Risk

- Build capacity of local institutions to provide supply chain expertise and training.
- Improve the logistics management information system.
- Negotiate framework contracts with suppliers of health commodities.

Hedging Against Risk

To hedge against supply chain risks, strategically placed resources are provided within the supply chain to make the supply chain less susceptible to the impact of risk events; this minimizes the disruption of operations (see box 6). One example of hedging is to place buffer stock at specific levels in the supply chain to respond rapidly to changes in demand. Another is to negotiate contracts with redundant suppliers who can be quickly called upon to fill emergency orders. Reducing order cycle times at a warehouse can also massively reduce the time needed to respond to emergency orders and therefore lessen the effect of sudden changes in demand at lower levels. Also, the potential impact of cash flow problems for health problem can be hedged if program costs are shared across partners.

Box 6. Examples of Strategies to Hedge Supply Chain Risk

- Increase buffer stock in the supply chain.
- Procure redundant suppliers of health commodities and logistics services.
- Reduce order cycle times at the central medical store.
- Share supply chain costs with partners.

Selecting Risk Responses

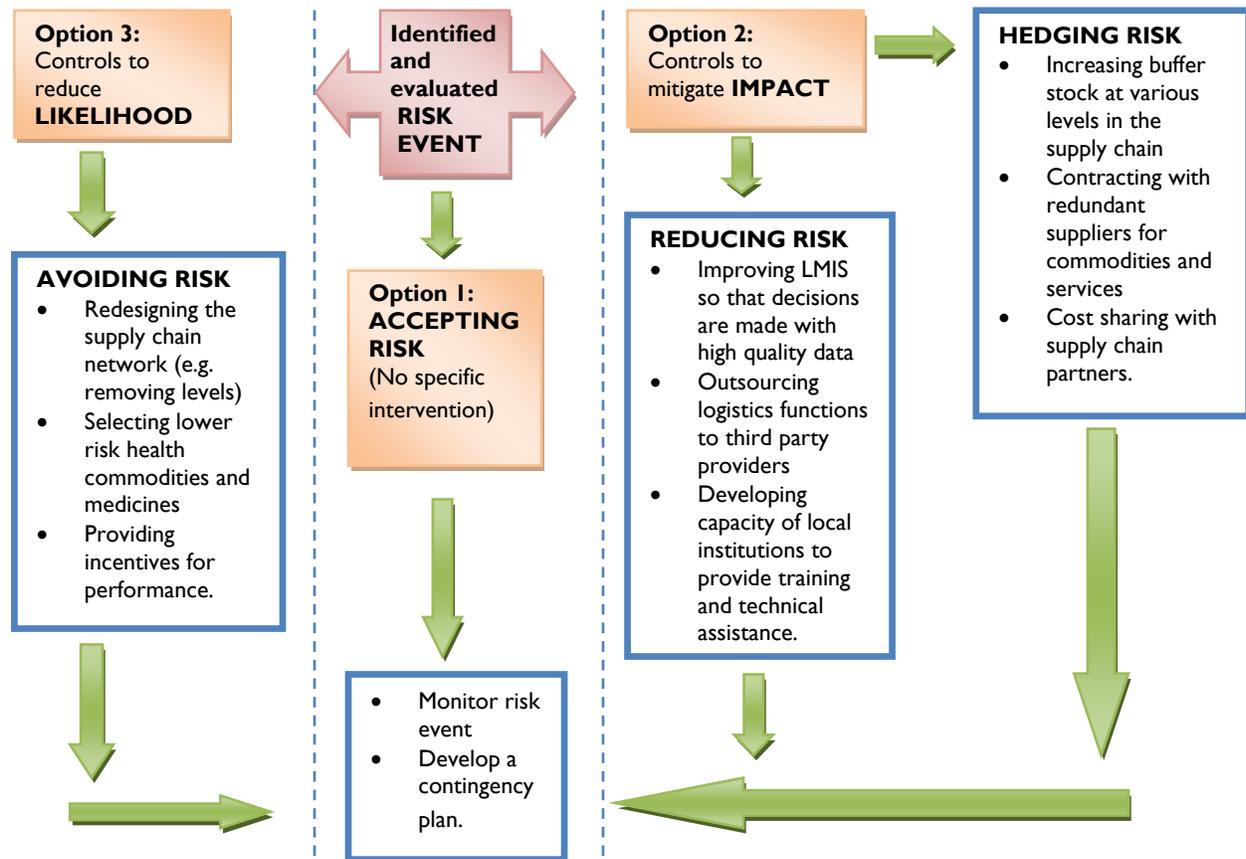
The supply chain risk management team and the health program leadership must jointly make the decision to accept, reduce, avoid, or hedge against supply chain risks. Several methods can be used to do this. One of the most frequently used is the bow-tie risk treatment method (Allen 2004, Gaudenzi 2006), which ties risk treatment to the likelihood and consequences of the risk event. See figure 4 for a modified version.

For example, a health program may determine that it faces the risk of facility-level stockouts if delivery truck drivers withdraw their services because of impending labor disputes. After evaluating the likelihood and impact of this risk event, the risk management team may conclude, based on available evidence (e.g., the critical number), that this risk does not require an intervention—the risk may be low in priority, or it may not be feasible to intervene, given the resources. In this case, the team will use option 1: accept the risk. If, however, the risk management team determines that this risk requires specific interventions, two options are available.

Option 2 is to introduce controls to reduce the *consequences* of the risk event, such as through *hedging*—the health program may increase the buffer stock for lower levels in the supply chain to minimize the disruptions if they miss one delivery. Disruption can also be minimized by *reducing* the risk to the supply chain through outsourcing the delivery function to a third party who recruits and manages their own drivers and fleet of vehicles.

Option 3 is to institute measures that reduce the likelihood of the event occurring. For instance, truck drivers may have less incentive to go on strike if they are given bonuses, or other incentives, for delivering commodities on time. In this case, to align the incentives of the truck drivers with those of the health program, performance incentives can be added to their contracts.

Figure 4. Selecting Risk Treatment Strategies for Public Health Supply Chains



The nature of some risks may require both option 2 and 3, simultaneously. In this case, a mix of responses can be selected.

The approach to select risk treatment strategies focuses only on the likelihood and impact of a risk event. However, other factors should be considered. For example, the risk management team should evaluate whether the causes of the risk are structural or operational. Structural causes of risk relate to the design of the supply chain; for instance, the number of levels in the supply chain. Risks from structural issues are best handled by avoiding them. For example, by removing an entire level from the supply chain (e.g., district stores), it may be possible to improve the delivery time of commodities to the lower levels of the supply chain. Operational causes of risk are those related to the way the logistics functions in the supply chain are carried out; for example, the logistics management information forms. For example, by making small adjustments to the LMIS forms, it may be possible to reduce the number of data entry errors and increase the accuracy of the logistics information.

Step 4. Risk Monitoring

The risk monitoring process includes identifying, analyzing, planning, and tracking new risks; constantly reviewing existing risks; monitoring trigger conditions for contingency plans; and monitoring residual risks. It also includes reviewing the execution of risk responses while evaluating their effectiveness. Risks can be monitored using routinely collected indicators in the LMIS or using new indicators specifically designed for risk management. Examples are included in the TRAC decision support tool, which is part of this toolkit.

Step 5. Incident Handling

Even with the best plans, health programs may still confront crises in their supply chains. Supply chain disruptions and dysfunctions can threaten the health program because of the intense time pressure; high stress; and need for rapid, but careful, decisionmaking. In a major crisis, significant change may be urgently required to protect life, assets, property, operations, income, and reputation of the health program and stakeholders.

It is important to develop a learning culture within the health program; this should be reflected in the incident handling strategy, including proactive measures to detect, respond to, and recover from an incident. The following steps should be followed during incident handling (Jüttner, 2005):

1. form an incident handling team
2. analyze and communicate details of the incident to all stakeholders
3. develop and implement a course of action
4. implement a post-incident review—after the crisis is resolved.

Public Health Supply Chain Risk Management Toolkit and Additional Resources

To help public health supply chain managers and their partners formalize and strengthen their approaches to supply chain risk management, the USAID | DELIVER PROJECT has a number of resources available on its website:

- This framing document, which introduces the basic concepts of supply chain risk management for public health in developing countries.
- A facilitator's guide for managing a stakeholder workshop to evaluate and prioritize identified supply chain risks for management attention.
- A PowerPoint slide deck that supports the facilitator's guide, but can be used generally for presenting public health supply chain risk management concepts (available on the project website).
- A series of data collection templates that support the evaluation, management, monitoring, and incident-handling activities.
- Two case studies that explain the processes and experiences of two projects that conducted risk management processes: SCMS Case Study and Task Order 5 Case Study.
- An Excel-based software tool (TRAC-DST) that supports analysis, decisionmaking, and reporting of supply chain risk management activities (available on the project website).

For any questions about these documents, please contact askdeliver@jsi.com.

Resources

- Allen, Norman, and Robert Lindroth. 2004. *Categorization of Supply Chain Risk and Risk Management, in Supply Chain Risk*. Edited by C. Brindley. London: Ashgate Publishers.
- Gaudenzi, Barbara, and Antonio Borghesi. 2006. "Managing risks in the supply chain using the AHP method", *The International Journal of Logistics Management* Vol. 17 Iss: 1: 114–136.
- Jia, Fu. 2009. *Cultural adaptation between Western buyers and Chinese suppliers*. Ph.D. thesis. United Kingdom: Cranfield University.
- Jia, Fu, and C. Rutherford. 2010. "Mitigation of supply chain relational risk caused by cultural differences between China and the West." *The International Journal of Logistics Management* 21 (2): 251–270.
- Johnson, M. Eric. 2001. "Learning From Toys: Lessons in Managing Supply Chain Risk from the Toy Industry." *California Management Review* 43 (3): 106–124
- Jüttner, U. 2005. "Supply chain risk management: Understanding the business requirements from a practitioner perspective." *The International Journal of Logistics Management* 16(1): 120–141.
- Jüttner, U., H. Peck, and M. Christopher. 2003a. "Building Resilient Supply Chains using Supply Chain and Traditional Risk Management and Insurance Techniques." *The International Journal of Logistics Management* 6: 197–210.
- Jüttner, U., H. Peck, and M. Christopher. 2003b. "Supply Chain Risk Management: Outlining an Agenda for Future Research." *The International Journal of Logistics: Research and Applications* 6(4): 197–210.

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