

# Proven Practices

# A Systematic Review

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Brief #8 in the *Promising Practices in Supply Chain Management Series*



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This brief is part of the *Promising Practices in Supply Chain Management* series, developed by the Supply and Awareness Technical Reference Team (TRT) of the [UN Commission on Life-Saving Commodities for Women’s and Children’s Health](#) (the Commission or UNCoLSC). As part of the [Every Woman Every Child](#) movement and efforts to meet the health-related Millennium Development Goals by 2015 and beyond, the Commission is leading activities to reduce barriers that block access to essential health commodities. The Supply and Awareness TRT developed this set of briefs on promising practices in supply chain management to guide countries in identifying and addressing key bottlenecks in the supply and distribution of the Commission’s 13 life-saving commodities across the reproductive, maternal, neonatal, and child health continuum of care.

This series of briefs has been developed for use by in-country stakeholders. The briefs provide both *proven* and *promising* practices that may be used to address specific supply chain barriers faced by each country.

- *Proven practices* are defined as interventions with proven outcomes in improving health commodity supply chains in low- and middle-income countries tested using experimental or quasi-experimental evaluation designs. Examples of proven practices are identified by this symbol throughout these briefs. 
- *Promising practices* are defined as interventions showing progress toward improving health commodity supply chains in low- and middle-income countries.

To view all the briefs in the Promising Practices in Supply Chain Management Series, visit <http://siapsprogram.org/publication/promising-practices-in-supply-chain-management>

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### Abbreviations and Acronyms

ACT	artemisinin-based combination therapy	LMIS	Logistics Management Information System
CAPSS	Consortium for ACT Private Sector Subsidy	MeSH	Medical Subject Headings
CP	Commodity Planner	NGO	nongovernmental organization
ICS	inventory control system	SDP	service delivery point
LMIC	low- and middle-income countries	STG	standard treatment guidelines

# Objectives and Definitions

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The objective of this review was to identify proven practices that improve outcomes for health supply chains in low- and middle-income countries (LMICs). While recognizing that there are numerous practices making observable and significant improvements in supply chains throughout the world, practices that have been tested using experimental or quasi-experimental designs provide the most objective evidence of their effectiveness. The following definition for proven practice was used for this review:

*Proven practice: Interventions with proven outcomes in improving health commodity supply chains in low- and middle-income countries tested using experimental or quasi-experimental evaluation designs.*

An experimental design includes: (1) pre-post design; (2) an intervention/treatment group and a control group; and (3) random assignment to groups. A quasi-experimental design lacks one or more of the elements of a true experimental design. For the purposes of this review, a quasi-experimental design must include at least an intervention/treatment and control group and a pre-post design but need not include randomization.

## Methodology

To identify proven practices, a systematic literature review was conducted using MEDLINE (biomedical research) and SocINDEX (social science research) databases. These databases were chosen because of their comprehensive collections. Selection criteria and search methods were determined before the start of the review to reduce any potential selection bias by reviewers.

## Search Methods

The following search terms, and their database-controlled vocabulary equivalents<sup>1</sup> were used. Terms 2-19 were used in combination with the terms “supply chain” and “supply management”:

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<sup>1</sup> Medical Subject Headings (MeSH) terms are a controlled vocabulary used to index database sources. When MeSH terms are used, keywords are automatically translated into relevant MeSH terms and synonyms. For example, using MeSH terms “supply chain” becomes “(“supply and distribution”[Subheading] OR “supply”[All Fields] AND “distribution”[All Fields]) OR “supply and distribution”[All Fields] OR “supply”[All Fields]) AND chain [All Fields].”

1. supply chain (health or medical) or “supply management”	12. inventory control system or ICS
2. commodity/commodities/product(s)/supply or “health commodity”	13. inventory management
3. vaccines	14. community-based distribution
4. stock outs/stock-out/stockout	15. commodity security
5. distribution	16. evaluation
6. data management	17. intervention
7. warehouse/warehousing	18. lessons learned
8. service delivery	19. best practices
9. utilization	20. developing country/setting
10. logistics	21. low and middle income country/setting
11. logistics management information system or LMIS	

All searches were completed in July and August 2013. A list of the articles found was produced if the initial resulting journal articles could be reduced to a reasonable number. Reasonable was subjective to the searcher’s rapid observation of relevant studies. If the bulk of results appeared to fall outside the proposed methodology selection criteria, then limiting search terms (identified by the Boolean term *NOT*) were applied, and in some cases, were further limited by geography to include only LMICs. Duplicate studies appearing in the results of more than one report were omitted in subsequent reports. Through these search methods, 481 abstracts were identified. Annex A provides a complete list of the exact search term combinations used and the resulting number of abstracts.

## Selection Criteria


Selection criteria were used to determine the articles to be included as proven practices, as shown in table 1. First, titles and abstracts were examined to remove obviously irrelevant materials. Full text documents were examined when insufficient detail was provided in the abstract to determine whether the article met the selection criteria.

### Selection Criteria for Proven Practices

<b>Study design</b>	Experimental or quasi-experimental; meta-analyses may be included if they are of interventions using experimental or quasi-experimental designs
<b>Setting</b>	Low- and middle-income countries
<b>Intervention</b>	Interventions to improve in-country supply chains
<b>Commodity</b>	Any health commodity (medicine, supplies, etc.)
<b>Delivery system</b>	Any (public, private, nongovernmental [NGO], etc.)
<b>Publication/ intervention years</b>	Last 20 years
<b>Outcome measures</b>	Any proven positive outcomes to improve supply chain are acceptable. Examples include: <ul style="list-style-type: none"> <li>• Increase in product availability (reduction in stock-outs)</li> <li>• Increase in product utilization</li> <li>• Increase in reporting frequency, completeness, or accuracy</li> <li>• Reduction in supply chain costs</li> </ul>

## Results

Of the 481 abstracts identified, only three articles met the selection criteria. To ensure that all proven practices that met the criteria had been identified, abstracts from a separate systematic literature review conducted by Pamela Steele were also reviewed.<sup>2</sup> Of the 63 results deemed relevant from Steele's review, one additional article met the selection criteria. Finally, during the subsequent search for promising practices, two examples were found that met the definition for "proven practices" and were added to the list.

The qualifying articles are summarized in table 2. Each article is used as an example in the promising practices briefs, marked with  to denote that the practice meets the definition for a "proven practice."

### Articles Meeting Proven Practice Criteria

Article	Abstract
<b>Citation</b> Talisuna AO et al. <a href="#">Closing the access barriers for effective anti-malarials in the private sector in rural Uganda: Consortium for ACT private sector subsidy (CAPSS) pilot study</a> . <i>Malaria Journal</i> . 2012; 11:356. doi:10.1186/1475-2875-11-356.	<b>Background:</b> Artemisinin-based combination therapy (ACT), the treatment of choice for uncomplicated falciparum malaria, is unaffordable and generally inaccessible in the private sector, the first port of call for most malaria treatment across rural Africa. Between August 2007 and May 2010, the Uganda Ministry of Health and the Medicines for Malaria Venture conducted the Consortium for ACT Private Sector Subsidy (CAPSS) pilot study to test whether access to ACT in the private sector could be improved through the provision of a high level supply chain subsidy.
<b>Proven Practice Utilized</b> Subsidizing underutilized commodities	<b>Methods:</b> Four intervention districts were purposefully selected to receive branded subsidized medicines - "ACT with a leaf", while a fifth district acted as the control. Baseline and evaluation outlet exit surveys and retail audits were conducted at licensed and unlicensed drug outlets in the intervention and control districts. A survey-adjusted, multivariate logistic regression model was used to analyze the intervention's impact on: ACT uptake and price; purchase of ACT within 24 hours of symptom onset; ACT availability and displacement of sub-optimal anti-malarial.
<b>Brief Where Highlighted</b> <a href="#">Promising Practices in Service Delivery and Utilization</a>	<b>Results:</b> At baseline, ACT accounted for less than 1% of anti-malarials purchased from licensed drug shops for children less than five years old. However, at evaluation, "ACT with a leaf" accounted for 69% of anti-malarial purchased in the interventions districts. Purchase of ACT within 24 hours of symptom onset for children under five years rose from 0.8% at baseline to 26.2% (95% CI: 23.2-29.2%) at evaluation in the intervention districts. In the control district, it rose modestly from 1.8% to 5.6% (95% CI: 4.0-7.3%). The odds of purchasing ACT within 24 hours in the intervention districts compared to the control was 0.46 (95% CI: 0.08-2.68, p=0.4) at baseline and significant increased to 6.11 (95% CI: 4.32-8.62, p<0.0001) at evaluation. Children less than five years of age had "ACT with a leaf" purchased for them more often than those aged

<sup>2</sup> Steele P. *What in-country public health supply chain factors affect the availability of medical products at the service delivery point in developing countries: A systematic literature review*. Unpublished doctoral dissertation, , Bedfordshire, UK: Cranfield University; 2013.

Article	Abstract
<p><b>Citation</b> Sabot OJ et al. <a href="#">Piloting the Global Subsidy: The Impact of the Subsidized Artemisinin-Based Combination Therapies Distributed through Private Drug Shops in Rural Tanzania</a>. <i>PLoS One</i>. 2009; 4(9): e6857. doi:10.1371/journal.pone.0006857.</p> <p><b>Proven Practice Utilized</b> Subsidizing underutilized commodities</p> <p><b>Brief Where Highlighted</b> <a href="#">Promising Practices in Service Delivery and Utilization</a></p>	<p>above five years. There was no evidence of price gouging.</p> <p><b>Conclusions:</b> These data demonstrate that a supply-side subsidy and an intensive communications campaign significantly increased the uptake and use of ACT in the private sector in Uganda.”</p> <p><b>Background:</b> WHO estimates that only 3% of fever patients use recommended artemisinin-based combination therapies (ACTs), partly reflecting their high prices in the retail sector from where many patients seek treatment. To overcome this challenge, a global ACT subsidy has been proposed. We tested this proposal through a pilot program in rural Tanzania.</p> <p><b>Methods/Principal Findings:</b> Three districts were assigned to serve either as a control or to receive the subsidy plus a package of supporting interventions. From October 2007, ACTs were sold at a 90% subsidy through the normal private supply chain to intervention district drug shops. Data were collected at baseline and during intervention using interviews with drug shop customers, retail audits, mystery shoppers, and audits of public and NGO facilities. The proportion of consumers in the intervention districts purchasing ACTs rose from 1% at baseline to 44.2% one year later (<math>p &lt; 0.001</math>), and was significantly higher among consumers purchasing for children under 5 than for adults (<math>p = 0.005</math>). No change in ACT usage was observed in the control district. Consumers paid a mean price of \$0.58 for ACTs, which did not differ significantly from the price paid for sulphadoxine-pyrimethamine, the most common alternative. Drug shops in population centers were significantly more likely to stock ACTs than those in more remote areas (<math>p &lt; 0.001</math>).</p> <p><b>Conclusions:</b> A subsidy introduced at the top of the private sector supply chain can significantly increase usage of ACTs and reduce their retail price to the level of common monotherapies. Additional interventions may be needed to ensure access to ACTs in remote areas and for poorer individuals who appear to seek treatment at drug shops less frequently.”</p>
<p><b>Citation</b> World Bank. <a href="#">World Bank policy note: enhancing public supply chain management in Zambia</a>. Washington, DC: World Bank; 2012.</p> <p><b>Proven Practice Utilized</b> Dedicated logistics personnel</p> <p><b>Brief Where Highlighted</b> <a href="#">Promising Practices in Human Resources</a></p>	<p><i>Two models to improve logistics capacity at the district level were designed and tested in this study. Both models were deemed to be effective with Model B proving more effective than Model A.</i></p> <p><b>Model A:</b> Eight districts implemented a model in which a Commodity Planner (CP) was added at the district level. The CP was responsible for coordinating orders from Service Delivery Points (SDPs) and managing stock at the district. This included summing requisitions from SDPs, matching against stock available at the district and adjusting orders as necessary to create one requisition from the district to Medical Stores Limited (MSL). When orders arrived, the CP was responsible for packing the stock for the districts. In districts with pharmacy technicians the role of the CP was filled by them; in districts with vacant pharmacy technician position an external CP was hired. Results from the pilot’s evaluation showed statistically significant improvements in access to some</p>

Article	Abstract
<p><b>Proven Practice Utilized</b> Level jumping</p> <p><b>Brief Where Highlighted</b> <u><i>Promising Practices in Distribution</i></u></p>	<p>trace commodities including DepoProvera, Cotrimoxazole (CTX), and adult ACTs; though when looking at duration of stockouts the pilot made only marginal improvements over the comparison districts. Storage conditions, reporting rates and other measures of effectiveness also improved.</p> <p><b>Model B:</b> Eight districts implemented a model in which storage and management of commodities for health facilities at the district level was eliminated; instead the district store became a “cross dock” or point of transit where it received pre-packaged shipments from the central level warehouse which were then delivered to health facilities without any changes to the order. Health facilities were responsible for filling out commodity orders and sending them to the district. The district again acted as a point of transit for orders, sending them to the central warehouse without making any changes.</p> <p>Although the districts were still responsible for making sure health facilities received the commodities, they were no longer responsible for managing how many commodities the health facility should receive. The research done during the pilot period showed that even this small change of “level jumping” without direct delivery made a significant difference in commodity availability. The districts where cross-docking was implemented showed large improvements over the control districts in the reduction of stock-outs for all commodities. For example, pediatric ACTs were stocked out an average of 29 days in comparison districts while only stocked out for an average of 5 days in the districts where cross docking was implemented; similar patterns were true for other tracer commodities. Other measures of supply chain effectiveness, such as storage and reporting rates, also improved in the implementation districts. Finally, researchers estimate that if the model were to be implemented district wide, under 5 mortality would decrease by 21% and over 5 mortality would decrease by 25%.</p>
<p><b>Citation</b> Trap B, Todd CH, Moore H et al. <u><i>The impact of supervision on stock management and adherence to treatment guidelines: A randomized controlled trial.</i></u> <i>Health Policy and Planning</i>, 2001; 16(3): 273-280.</p> <p><b>Proven Practice Utilized</b> Performance management and supportive supervision for supply chain activities</p> <p><b>Brief Where Highlighted</b> <u><i>Promising Practices in Human Resources</i></u></p>	<p>“Ensuring the availability of essential drugs and using them appropriately are crucial if limited resources for health care are to be used optimally. While training of health workers throughout Zimbabwe in drug management (including stock management and rational drug use) resulted in significant improvements in a variety of drug use indicators, these achievements could not be sustained, and a new strategy was introduced based on the supervision of primary health care providers. This was launched in 1995 with a training course in supervisory skills for district pharmacy staff. In order to evaluate the impact of the supervision and the effectiveness of the training programme, adherence to standard treatment guidelines (STG) and stock management protocols was evaluated in a randomized controlled trial. The study compared three different groups of health facilities: those that received supervision for either use of STG (n=23) or stock management (n=21) – each facility acting as control for the other area of supervision – and a comparison group of facilities which received no supervision (n= 18). On-the-spot supervision by a specially trained pharmacy staff, based around identified deficiencies, took place at the start of the study and 3 months later. The evaluation compared performance on a variety of drug management indicators at baseline and 6–8 months after the</p>

Article	Abstract
<p><b>Citation</b> Soeters R, Peerenboom PB, Mushagalusa P et al. <a href="#">Performance-Based Financing Experiment Improved Health Care in the Democratic Republic of the Congo</a>. <i>Health Affairs</i>. 2011; 30(8): 1518-27.</p> <p><b>Proven Practice Utilized</b> Performance-based financing at the service delivery point</p> <p><b>Brief Where Highlighted</b> <a href="#">Promising Practices in Service Delivery and Utilization</a></p>	<p>second supervisory visit. The results of the study showed that, following supervision, overall stock management improved significantly when compared with the control and comparison groups. Similar improvements were demonstrated for adherence to STG, although the effect was confounded by other interventions. The study also showed that supervision had a positive effect on improving performance in areas other than those supervised, and demonstrated that pharmacy technicians with limited clinical skills can be trained to influence primary healthcare workers to positively improve prescribing practices. Allocating resources to supervision is likely to result in improved performance of health workers with regard to the rational use of essential drugs, resulting in improved efficiency and effectiveness.”</p> <p>“In some low-income countries such as Cambodia and Rwanda, experimental performance-based payment systems have led to rapid improvements in access to health care and the quality of that care. Under this type of payment scheme, funders—including foreign governments and international aid programs—subsidize local health care providers for achieving certain benchmarks. The benchmarks can include such measures as child immunizations or childbirth in a health facility. In this article we report the results of a performance-based payment experiment conducted in the Democratic Republic of Congo, which is one of the poorest countries in the world and has an extremely high level of child and maternal mortality. We found that providing performance-based subsidies resulted in lower direct payments to health facilities for patients, who received comparable or better services and quality of care than those provided at a control group of facilities that were not financed in this way. The disparity occurred despite the fact that the districts receiving performance-based subsidies received external foreign assistance of approximately \$2 per capita per year, compared to the \$9–\$12 in external assistance received by the control districts. The experiment also revealed that performance-based financing mechanisms can be effective even in a troubled nation such as the Democratic Republic of Congo.”</p>
<p><b>Citation</b> Björkman M and Svensson J. <a href="#">Power to the People: Evidence from a Randomized Field Experiment on Community-Based Monitoring in Uganda</a>. <i>The Quarterly Journal of Economics</i>. 2009; 124(2), 735-69.</p> <p><b>Proven Practice Utilized</b> Increasing community participation in service delivery accountability</p> <p><b>Brief Where Highlighted</b> <a href="#">Promising Practices in Service Delivery and Utilization</a></p>	<p>“This paper presents a randomized field experiment on community-based monitoring of public primary health care providers in Uganda. Through two rounds of village meetings, localized nongovernmental organizations encouraged communities to be more involved with the state of health service provision and strengthened their capacity to hold their local health providers to account for performance. A year after the intervention, treatment communities are more involved in monitoring the provider, and the health workers appear to exert higher effort to serve the community.” In addition, the intervention had a statistically significant effect on reducing stockouts.</p>



## Conclusion

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From the onset, the reviewers knew they were unlikely to find a large number of practices proven to improve health supply chains. The proven practice definition used is most relevant to supply chain interventions that use an academic-style approach to evaluation. Private sector supply chains, for example, may be more likely to use metrics, such as profit margins, cost effectiveness, performance improvements, and accreditation to qualify something as a proven practice. Furthermore, some supply chain interventions do not lend themselves well to an experimental design as they include: numerous components implemented at multiple levels of the health system, thereby making cause and effect difficult to isolate; are employed in complicated, uncontrolled environments; and/or lack the resources to conduct a rigorous evaluation.

More rigorous evaluation of supply chain interventions would greatly benefit the global community by setting the stage for implementers to learn from each other's work, allowing for the allocation of resources to proven practices, and creating a body of evidence needed for global advocacy. While proven practices may be limited in number, the briefs in this series show that there is an emerging body of promising practices already being used for knowledge sharing, advocacy, and most importantly, improving the availability of commodities.

## Annex A: Search Term Combinations and Number of Hits

Summary of Terms Used	Exact Terms Used <sup>3</sup>	Resulting Number of Abstracts
<b>MEDLINE</b>		
Supply chain and best practices	1 and 19 (with MeSH terms)	3
	1 and 19 (original terms only)	27
Supply chain and commodities	(1 OR "supply chain" OR "supply management") AND (2 OR "commodity" OR "product" OR "supply" OR "health commodity") NOT US NOT "United States" Chose Geography from list of hits: China, South Africa, Brazil, India, Uganda, Thailand, Africa, Africa south of the Sahara MeSH plus original and additional terms	60
Supply chain and vaccines	(1 OR "supply chain" OR "supply management") AND 3 MeSH plus original terms	9
Supply chain and and stockout	(1 OR "supply chain" OR "supply management") AND (4 OR "stock out" OR "stock-out" OR "stockout") MeSH plus original terms	9
Supply chain and distribution	(1 OR "supply chain" OR "supply management") AND (5 OR "distribution") NOT US NOT "United States" Chose Geography from list of hits: Uganda, Africa, Brazil, South Africa, Thailand, Zambia, Ethiopia, India, Malawi, Mexico, Niger, Tanzania, Africa south of the Sahara, Argentina, Asia, Asia, southeastern, Benin, Cambodia, China MeSH plus original term	37
Supply chain and data management	(1 OR "supply chain" OR "supply management") AND (6 OR "data management") NOT US NOT "United States" Chose Geography from list of hits: India, Burkina Faso, Nepal, Nigeria, Poland, Thailand, Zambia MeSH plus original term	8
Supply chain or supply management and warehouse	(1 OR "supply chain" OR "supply management") AND 7 Original term only	1
Supply chain and service delivery	(1 OR "supply chain" OR "supply management") AND 8 NOT US NOT "United States" Chose Geography from list of hits: Africa, India, South Africa, Africa south of the Sahara, Brazil, China, Ghana, Guatemala, Kenya, Malawi, Nigeria, Papua New Guinea, Singapore, Thailand, Uganda, Zambia MeSH plus original term	19
Supply chain and utilization	(1 OR "supply chain" OR "supply management") AND 9 NOT US NOT "United States" Chose Geography from list of hits: Uganda, Burkina Faso, Ethiopia, India, Kenya, Morocco, Niger, Peru, Philippines, Senegal, South Africa, Thailand MeSH plus original term	11
Supply chain and logistics	(1 OR "supply chain" OR "supply management") AND 10 NOT US NOT "United States" Chose Geography from list of hits: Brazil, India, Uganda, Africa, Poland MeSH plus original term	15

<sup>3</sup> Numbers correspond to the terms listed on Page 4. The search terms are summarized in the first column.

<b>Summary of Terms Used</b>	<b>Exact Terms Used<sup>3</sup></b>	<b>Resulting Number of Abstracts</b>
Supply chain and LMIS	(1 OR "supply chain*" OR "supply management") AND 11 NOT US NOT "United States" Chose Geography from list of hits: Burkina Faso, Ethiopia, Morocco, Philippines, Senegal, Uganda MeSH plus original and additional terms	3
Supply chain and ICS	(1 OR "supply chain*" OR "supply management") AND 12 NOT US NOT "United States" Chose Geography from list of hits: Morocco MeSH plus original and additional terms	1
Supply chain and inventory management	(1 OR "supply chain*" OR "supply management") AND 13 NOT US NOT "United States" Chose Geography from list of hits: India, Burkina Faso, Ethiopia, Morocco, Philippines, Poland, Senegal, Uganda MeSH plus original term	6
Supply chain and community-based distribution	(1 OR "supply chain*" OR "supply management") AND 14 NOT US NOT "United States" Chose Geography from list of hits: Uganda, Africa, Brazil, India, Kenya, South Africa, Tanzania, Asia, Asia, southeastern, Cambodia, China, Hungary, Iran, Malawi, Malaysia, Nepal, Nigeria, Papua New Guinea, Peru, Philippines, Senegal, Singapore, Thailand MeSH plus original term	31
Supply chain and commodity security	(1 OR "supply chain*" OR "supply management") AND 15 MeSH plus original term	2
Supply chain and evaluation	(1 OR "supply chain*" OR "supply management") AND 16 NOT US NOT "United States" Chose Geography from list of hits: Uganda, Africa, Brazil, India, Taiwan, China, Kenya, Thailand, Africa south of the Sahara, Asia, southeastern, Burkina Faso, Ethiopia, Mexico, Morocco, Poland, Singapore MeSH plus original term	53
Supply chained and intervention	(1 OR "supply chain*" OR "supply management") AND 17 NOT US NOT "United States" Chose Geography from list of hits: Zambia, Tanzania, Brazil, Nigeria, Singapore, South Africa MeSH plus original term	11

Summary of Terms Used	Exact Terms Used <sup>4</sup>	Resulting Number of Abstracts
<b>SocINDEX</b>		
Supply chain & LMIC or developing country	(1) AND (20 OR 21) NOT US NOT "United States" NOT environment* NOT agricultur* NOT cloth* NOT invest* Chose Geography from list of hits: developing countries, Cuba, developing--economic policy, Kenya, Pakistan, Africa, Asia, Bangladesh, Bhopal (India), Ethiopia, India, Indonesia, Iran, Latin America, Nigeria, Philippines, South Africa, Turkey Sociology Thesaurus + Original terms	13
Supply chain and best practices	(1 AND 19) Sociology Thesaurus + Original terms	19
Supply chain and commodity	1 AND 2 Sociology Thesaurus + Original terms Chose Geography from list of hits: 1 AND 2 NOT US NOT "United States" NOT environment* NOT agricultur* NOT cloth* NOT invest* NOT food NOT auto* NOT grocery NOT farm alcohol NOT narcotic* Chose Geography from list of hits: Beijing (China), Hong Kong (China), Lianoning Sheng (China), Panama, Rio de Janeiro (Brazil), Saint Petersburg (Russia) Sociology Thesaurus + Original terms	7
Supply chain and vaccines	1 AND 3 NOT US NOT "United States" Sociology Thesaurus + Original terms	6
Supply chain and distribution	1 AND 4 NOT US NOT "United States" Sociology Thesaurus + Original terms	16
Supply chain and distribution	1 AND 5 NOT US NOT "United States" NOT environment* NOT agricultur* NOT cloth* NOT invest* NOT food NOT auto* NOT grocery NOT farm NOT alcohol NOT narcotic* Chose Geography from list of hits: China, Cuba, Brazil, Czech Republic, Czechoslovakia, Hong Kong(China),India, south, Indonesia, Mexico, Namibia, OECD countries, Panama, Philippines, Russia(federation), South Africa, Thailand Sociology Thesaurus + Original terms	16
Supply chain and warehousing	1 AND 7 NOT US NOT "United States" NOT environment* NOT agricultur* NOT cloth* NOT invest* NOT food NOT auto* NOT grocery NOT farm NOT alcohol NOT narcotic* Sociology Thesaurus + Original terms	4
Supply chain and service delivery	1 AND 8 NOT US NOT "United States" NOT environment* NOT agricultur* NOT cloth* NOT invest* NOT food NOT auto* NOT grocery NOT farm NOT alcohol NOT narcotic* Sociology Thesaurus + Original terms	3
Supply chain and utilization	1 AND 9 NOT US NOT "United States" NOT environment* NOT agricultur* NOT cloth*NOT invest* NOT food NOT auto* NOT grocery NOT farm NOT alcohol NOT narcotic* Chose Geography from list of hits: Caribbean area, Jamaica ,Malaysia, Melanesia Sociology Thesaurus + Original terms	4
Supply chain and logistics	1 AND 10 NOT US NOT "United States" NOT environment* NOT agricultur* NOT cloth* NOT invest* NOT food NOT auto* NOT grocery NOT farm NOT alcohol NOT narcotic* Chose Geography from list of hits: Africa, Asia, southeastern, Mexico, Singapore Original term only	4

<sup>4</sup> Numbers correspond to the terms listed on Page 4. The search terms are summarized in the first column.

Supply chain and inventory management	1 AND 13 Original term only	6
Supply chain and commodity security	1 AND 15 NOT US NOT "United States" NOT environment* NOT agricultur* NOT cloth*NOT invest* NOT food NOT auto* NOT grocery NOT farm NOT alcohol NOT narcotic* NOT job* NOT "human resource*" NOT hous* NOT neopopulism NOT educat* NOT oil NOT civic NOT migrat* Chose Geography from list of hits: Asia, Argentina, amazon river region, Africa, sub-Saharan, Africa, east, Singapore, Nigeria, Middle East, Lithuania, Kenya, Czech Republic, Bangladesh, Latin America, soviet union, OECD countries, Mexico, Brazil, India, Russia (federatation),Philippines Sociology Thesaurus + Original term	27
Supply chain and evaluation	1 AND 16 NOT US NOT "United States" NOT environment* NOT agricultur* NOT cloth* NOT invest* NOT food NOT auto* NOT grocery NOT farm NOT alcohol NOT narcotic* NOT job* NOT "human resource*" NOT hous* NOT neopopulism NOT educat* NOT oil NOT civic NOT migrat* Sociology Thesaurus + Original term	25
Supply chain and intervention	1 AND 17 NOT US NOT "United States" NOT environment* NOT agricultur* NOT cloth*NOT invest* NOT food NOT auto* NOT grocery NOT farm NOT alcohol NOT narcotic* NOT job* NOT "human resource*" NOT hous* NOT neopopulism NOT educat* NOT oil NOT civic NOT migrat Original term only	18
Supply chain and lessons learned	1 AND 18 NOT US NOT "United States" NOT environment* NOT agricultur* NOT cloth* NOT invest* NOT food NOT auto* NOT grocery NOT farm NOT alcohol NOT narcotic* NOT job* NOT "human resource*" NOT hous* NOT neopopulism NOT educat* NOT oil NOT civic NOT migrat Original term only	7