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Always Cola, Rarely Essential Medicines:
Comparing Medicine and Consumer Product Supply Chains in the Developing World

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Abstract

The World Health Organization estimates that almost a third of the world's population still lacks access to essential medicines. The distribution network for medicines is ineffective and inefficient in many developing countries. Discussions often centre on why the medicines supply chain cannot replicate the supply chain for consumer products and beverages. There is little understanding of the similarities and differences between the two supply chains. This article compares these two supply chains in developing countries from a structural and incentive perspective. It illustrates the complexity of medicine supply chains, and highlights the important differences between these and consumer beverage (soft drink) supply chains.

Introduction

Improvement in health is one of the central goals and often the key outcome of global efforts towards long term economic development in the world (Sachs et al 2001). According to the WHO almost a third of the world's population still lacks access to essential medicines (WHO 2004). The lack of access is due to a number of interrelated and complex issues: First, despite the increased availability of financial resources and the development of new drugs and vaccines, the reach of these products remains poor (Frost and Reich 2009). Second, affordability of the medicines presents a significant problem. Third, in many low and middle income countries the distribution network for medicines is ineffective and inefficient which results in poor availability of medicines to the poorer sections of populations. Such issues are especially pronounced in areas of the world such as Sub-Saharan Africa where health care infrastructure is poor and the prevalence of communicable diseases is extremely high.

The supply and distribution chains for medicines and vaccines in Sub-Saharan Africa are organized using a wide array of structural and institutional arrangements (Govindaraj et al 2000, Attridge and Preker 2000). Usually a complex combination of institutions specializing in manufacturing, import, wholesaling, retailing and various other auxiliary functions have to join forces to make the drug available to the end-patient (Attridge and Preker 2000). Various international agencies such as the World Health Organization, the World Bank and PEPFAR have recognized the need for a deeper and structured understanding of the issues affecting the supply chains for medicines and vaccines in Sub-Saharan Africa. Discussions often tend to center on a desire to replicate the efficiency and effectiveness of the supply chains for consumer

products and comparisons are often drawn between the supply chain for non-alcoholic consumer beverages (soft drinks) and that for medicines. However, there is little understanding of the similarities and differences between the two supply chains.

This article compares these two supply chains in developing countries from a structural and incentive perspective. The objective is to carry out a first level diagnosis of the structural differences in each. For the purposes of this article, the discussion is based on stylized representations of these supply chains. As table 1 illustrates, we highlight the complexity of medicine supply chains, and then draw comparisons to highlight the important differences between these and soft drink supply chains.

Factor	Medicines supply chain	Soft drinks supply chain
Production	• Production occurs mostly internationally • Capital and highly skill intensive production process • Strictly regulated • Large economies of scale	• Concentrate production carried out internationally • Bottling is a relatively less capital and skill intensive process • Bottling carried out locally in each market
Information gathering	• Lack of systematic information collection tools • Expensive “one-off” monitoring and data collection • Central assumption based supply chain planning	• Systematic information collection tools • Innovative methods of data collection using third parties and own sales force • Data driven supply chain planning
Distribution	• Product specific distribution asset investments (both human and capital assets) • Higher need for traceability and security • Limited competition in the distribution segment • Poor contract compliance on attributes such as	• Generic distribution asset investments • Competition used to achieve higher contract compliance • Horizontal collaboration • Higher frequency of delivery to retail /points of sale

	service level, delivery lead time etc. • Higher frequency of delivery to retail /points of sale	
Retail Point of sale	• Limited to regulated pharmacies or government run clinics • Limited innovation on new points of sales due to regulation	• Variety of retail sales points such as restaurants, bars or supermarkets, in cities, towns and smaller retail kiosks in rural areas. • Constantly innovating to create new points of sale
Incentive structures	• Limited ability to create incentives for actors in the supply chain in publicly run distribution systems • Simple single part contracts used	• Incentive alignment through contracting given due importance • Sales incentives, service level incentives commonly used in both pricing and employment contracts
Consumption benefits	• The consumption of some medicines, vaccines and other health products results in higher benefits to society as a whole and not necessarily to the individual who consumes. • Medicines are what people "need"	• The benefits from consumption of consumer products and soft drinks accrue primarily to the end-consumer. In fact, society may sometimes bear a cost from their consumption. • Soft drinks are what people "want".

Table 1: Medicine supply chains compared to soft drink supply chains

Previous studies have examined how lessons from the retail industry in the US could be applied to the healthcare industry to reduce costs and improve care (Agwunbi and London, 2009). Streamlining layers in the supply chain, and using purchasing volume to reduce prices were two such approaches, but the complexity of the healthcare industry can present serious challenges to implementing these solutions (Agwunbi and London, 2009). In the case of the developing world, differences between the fast moving consumer goods industry and the health care industry are

even starker. In this context, a high degree of demand and supply uncertainty impacts on both types of supply chain, however medicine supply chains are particularly vulnerable to issues of acceptability, affordability and availability (Stapleton, et al, 2009). This motivates the question:

> *Why do medicine supply chains in the developing world not operate like those of consumer products?*

We start with a stage by stage analysis of the differences and similarities between the two.

Production

The key areas of complexity in the production stage of the medicines supply chain pertain to high *capital intensity* in establishing a manufacturing infrastructure and *strict regulations.*

Manufacturers of soft drinks like Coca-Cola and Pepsi have followed a long-term strategy of localizing production and building infrastructure through partnerships with domestic companies. Soft drinks manufacturers for example start local bottling plants in joint-venture with domestic companies, reducing the cost of transporting internationally. To maintain control over the ingredients and to protect the intellectual property of the brand, the concentrate for the manufacture of the soft drinks is either imported or manufactured in a wholly foreign-owned factory in the developing country.

In contrast, most large pharmaceutical companies limit their manufacturing to one or two large global production facilities. This is most likely due to the lower costs of international transport relative to the higher fixed costs of establishing a plant (Kaplan and Laing 2005). It is also important for pharmaceutical companies to be able

to keep strict control on compliance with production regulations as pharmaceutical manufacturing is subject to international quality standards such as the GMP. When compared to soft drinks, many aspects of pharmaceutical production require higher *technical skill intensity*. The educational and vocational system in many low income countries may not currently have the ability to supply the engineers, pharmaceutical specialists and other skilled workers that are crucial for running a high quality and efficient pharmaceutical production plant.

Information Gathering

Lack of systematic information collection tools persists as a central problem impacting on medicine supply chains in the developing world. Obtaining an accurate estimate of the size of the market for specific medicines is extremely challenging due to the lack of knowledge on the size, income levels or location of the population (Levine et al 2008). Additionally, due to the lack of a well-established infrastructure, public health information is often unreliable or inconsistent. Thus, expensive *one off monitoring and evaluation* exercises are usually used.

Soft drink companies have realized the value of information and are willing to invest in information gathering even if it requires time consuming manual methods. In the case of soft drinks, employees of the company and/or the local partners work to coordinate deliveries, and visit retailers on a regular basis to take orders. Using the information they collect on each visit, they compile periodic consumption and stock status reports to ensure better logistical and financial planning. In some cases third party information aggregators invest in an information gathering infrastructure on behalf of many consumer product companies together. This reduces the individual costs for each soft drink company to obtain information that is vital for planning.

Rather than investing in point of sale information gathering, medicine supply chains continue to work on centrally made planning assumptions that do not have strong roots in data. Supply chain planners for medicines tend to attribute the lack of planning data to the absence of formal information systems. Instead of using the simple existing mechanisms for collecting information from the points-of-sale/dispensing or incentivizing third parties to do it on their behalf, they rely on expensive one-off monitoring and evaluation exercises.

Distribution

Medicine distribution requires *traceability* to ensure *security* in the supply chain. In some cases medicine distribution is limited only to *state run* distribution systems (central medical stores) which makes it difficult to create appropriate incentive structures. Even when medicine distribution occurs through a private distribution network, the regulatory framework and small size of the market prevents adequate competition. This lack of competition and the absence of efficient legal systems make *contract compliance* and *contract enforcement* problematic. A well functioning distribution network requires investment in physical and human assets. In the case of medicine supply chains these assets (human or physical) generally have a *high level of specificity* and are thus in short supply in the market place.

In the case of soft drinks, local partnerships allow international companies to leverage the knowledge and understanding of the distribution channel which the domestic partner brings. Such knowledge is usually tacit and is not possible to codify or embed it into company training manuals. The manufacturer has the incentive to ensure higher reach of its products at good quality and pricing terms. Achieving these goals depends upon the efforts of a local partner acting on the manufacturer's behalf. The partner's contract compliance and effort is difficult to observe or enforce in

developing countries. Soft drink companies manage this problem through a system of credible threats of competition and incentives for target achievement. If the domestic partner does not fulfill its contracted obligations on quality, pricing, reach, brand promotion or any of the other attributes essential for ensuring better market reach, the international company can threaten to bring in more competition. This helps to ensure higher compliance to contract terms by the incumbent local partner.

In medicine supply chains the partner is often the national government. State run pharmaceutical distribution continues to be dominant in many low income countries especially in Sub-Saharan Africa. The manufacturer has little if any ability to enforce its objectives. State run distribution systems work with an incentive structure that is very different from that of the manufacturer. Even when working with a private importation agent, structural and regulatory difficulties impede using creative methods to ensure contract compliance.

Furthermore, a broad array of distribution channels is used for soft drinks, to achieve expanded reach. Most soft drinks are sold through independent wholesale distributors (although direct-to-retail is now gaining ground in some areas). Some of these wholesaler distributors have been distributing products in their countries for many decades. They have significant political clout in the regions in which they operate. Trucks are the primary means of national distribution, with wholesalers often using bicycles and other locally appropriate means of transport at the local level.

In contrast, given the lack of quality monitoring capacity, it is safer to limit the distribution of medicines to a few tightly regulated distribution channels. Narrower distribution channels used for medicines also imply that the means of transport are limited to dedicated trucks and vans. Economies of scope in local transport cannot be fully realized. New technological developments in tracking and tracing technology

however, have shifted the efficient frontier so that traceability does not have to be compromised to increase channel breadth.

Finally, for soft drinks the assets required for effective distribution are often generic in nature and are generally widely available. Additionally, consumer product companies extensively use horizontal collaboration in distribution. Combining many different consumer product companies to create pooled distribution helps them increase the delivery *frequency of shipments* to the retail points of sale without increasing cost. A higher frequency of shipments means lower reliance on forecasts that are made for a long time horizon and lesser need for safety stocks.

In the case of medicine supply chains, the human and physical assets required for effective distribution are highly specific. They require investment in staff training and specialized equipment, for instance, refrigeration. However, the relatively low rates of revenue earned from affordable medicines can lead to poor investment in human or physical assets for pharmaceutical distribution. The inability to pool distribution assets with other categories results in a lower average delivery frequency to the retail points of sale.

Retail Points-of Sale

Medicines are limited to certain dispensing points. These points must be able to ensure *adequate equipment* for storage and have staff capable of providing accurate dispensing advice.

Soft drinks have to reach a variety of sales points such as restaurants, bars or supermarkets, in cities, towns and smaller retail kiosks in rural areas. Growth in sales and market share comes from tapping into new points of sale and creating value propositions that bundle service and product delivery. The ability to create new bundles of products and services comes from the relatively lower risk of poor quality

in service. Soft drinks companies also work to create new retail opportunities and spend time trying to understand the revenue and profit mix of each of their retailers. In some cases they may even help retailers with product category management.

In contrast, only pharmacists are allowed to carry out certain activities related to dispensing medicines, and trained pharmacists are not readily available in most developing countries. Similarly, warehouses and distribution centers for pharmaceuticals are specific and cannot be shared with other commodities. Also, there is very little evidence of effective bundling of service and product delivery in medicines except for pharmacist's dispensing advice. Some social marketing organizations, particularly those concerned with reproductive health commodities have been very successful in expanding reach. These organizations possess sufficient understanding of the business drivers at each point of sale and they use points of sale similar to those of consumer product companies. However, given the small size of developing country markets, pharmaceutical companies have little incentive to improve the retailers' understanding of issues such as; key revenue drivers, store-traffic drivers or profit drivers within and across product categories.

Incentive Structures and Risk-reward Sharing

Medicine manufacturers have a *limited ability to create incentives* for actors in the supply chain. Traditional forms of incentives are not necessarily suitable.

In soft drink supply chains a host of stakeholders are involved in making decisions about price, inventory, promotion and other factors. Individual decision makers optimizing their local objectives generally sub-optimize the overall system in order to mitigate the disproportionate risk. This could involve under-stocking a brand of drink. The manufacturer has a high incentive to ensure that the retailer keeps sufficient quantity of the product in stock. One approach for inducing the retailer to

increase stock levels is to increase the profit margin on sales. However, this leads to increased end customer price which may lead to lower demand due to affordability issues. Thus, in many instances the wholesaler offers a different wholesale price to the retailer on sales above a specified level. This has the effect of increasing the retailer's cost of having too little inventory. In a similar vein, soft drink companies offer financial incentives to wholesale distributors to improve reach (number of retail outlets) and sales in each outlet. Such contracts are the cornerstone of incentive management in soft drink distribution channels.

Although there is some understanding of the incentives of different stakeholders in the medicine supply chain, the nature of contracting used is still mostly simple single part contracts. Also, financial incentives to increase sales (and hence availability) as used by soft drinks companies are not as applicable in the case of medicines as they could lead to irrational drug use.

Nature of consumption benefits

When one person's consumption of a product has positive or negative effect on another person and those effects are included in the price paid by the consumer, the product is known to have a *benefit externality*. In general, when individuals are treated for an infectious disease, the rate of transmission throughout is potentially reduced. Thus the benefit from consumption of the medicine accrues in part to the individual and in part to the society. The highest burden of disease in most parts of the developing world comes from infectious diseases and the medicines have consumption benefit externalities. Society has to make extra effort (or subsidize their cost) to convince the individual to take these medicines and these are not products they always "want". On the other hand, consumption of a soft drink or other similar products leads to a benefit entirely to the consumer. The applicability of a truly

market driven supply chain for medicines is less clear than for consumer products and soft drinks. However, if demand creation activities, subsidies or other interventions can resolve some of this market imperfection, this key difference in the nature of consumption benefits between medicines and soft drinks becomes less significant.

Drug resistance and other related problems resulting from irrational use of medicines imply that any efforts to convert the "need" to "want" have to be cautious, regulated and controlled.

Conclusion

The ultimate delivery of the product to the end user in the developing world depends critically on having efficient networks of manufacturing, wholesaling and distribution in both urban and rural areas. As this article illustrates, there are many structural differences between medicine and soft drink supply chains in developing countries. It highlights that a deeper study of these differences could yield real benefits to medicine supply chains operating in developing countries.

Interestingly, many new initiatives have begun that are attempting to replicate some of the key success factors observed in the consumer product supply chains. For instance, *Village Reach* is an innovative model to deliver vaccines and drugs in Mozambique that circumvents the asset specificity problem in medicine distribution through creative bundling with other products. The *Affordable Medicines Facility for Malaria* is a pilot project to understand how points-of-sale and the breadth of the distribution channel can be expanded for anti-malaria medication (Laxminarayan and Gelband 2009) to achieve efficiencies without compromising quality or traceability. The *ACT Watch* project is a multi-year multi-country study funded by the Bill and Melinda Gates Foundation to use a third party to gather market data for anti-malarial medicines. The government of Tanzania has started a very successful *Accredited*

Drug Dispensing Outlet (ADDO) program to increase the retail points of dispensing essential drugs. Similar initiatives are underway in Zambia and Ghana. A new project called *ColaLife* is trying to utilize the secondary distribution channels of Coca-Cola in developing countries to carry 'social products', such as oral rehydration salts to save children's lives.

We remain very excited about how the multidisciplinary nature of technical expertise being made available to the field of global health through individual commitment, private philanthropy and government receptiveness is promoting innovations that can mimic the effectiveness and efficiency of soft drink supply chains while preserving the safety and traceability that are vital to medicine supply chains.

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