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Factoring Seasonality into Supply Planning

Photo Caption: A man crosses a flooded road in Liberia. Using a seasonality index to plan for shipments can help ensure that malaria products arrive in sufficient quantities prior to the rainy season.

A seasonality index can be applied to forecast consumption to obtain monthly consumption that accounts for seasonal variation.

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Quantification is the process of estimating the quantities and costs of the products required for a specific health program (or service) and determining when the products should be delivered to ensure an uninterrupted supply for the program.

Quantification consists of three steps: planning, forecasting, and supply planning. The planning stage entails describing the program; defining the scope, purpose, and timeframe of the quantification; and collecting the required data. Forecasting determines the quantities of products that are expected to be consumed during a specific period of time. Supply planning entails determining the quantities that should be ordered, and when shipments should arrive. Developing a supply plan is informed by a variety of data, including but not limited to: stocks on hand, quantities already on order (from all sources), established minimum and maximum stock levels[1], available funding, and procurement lead times. Sound, data-driven supply plans help to ensure a continuous supply of products, maintain stock levels between the established maximum and minimum levels, and minimize emergency orders.

Generally, shipments should be scheduled to arrive when the national-level months of stock (MOS) reaches the established minimum stock level, which can be commodity-specific. The quantity of product to order should bring the national MOS back up to the established maximum stock level. The traditional approach to supply planning is to use the annual forecast consumption and divide by 12 to get an average monthly consumption (AMC).

For some malaria products, such as artemisinin-based combination treatments (ACTs) and other products with seasonal demand, using a standard AMC for shipment scheduling can lead to overstocks in the dry season, and stockouts in the rainy season, as this average does not consider seasonal variation.

[1] Maximum and minimum stock levels are set as part of a logistics system design process, and are based on several variables, including lead time, safety/buffer stock, and review periods

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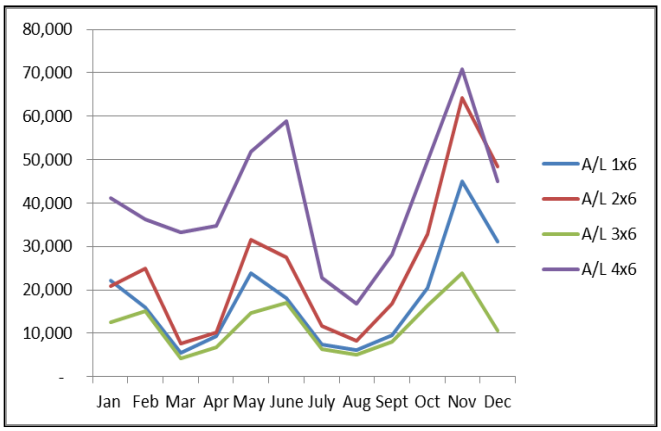
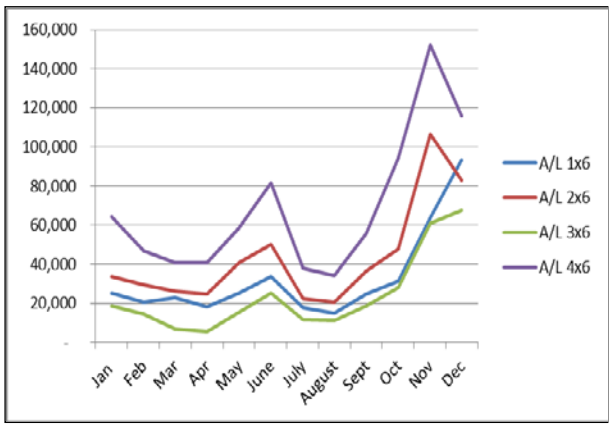
An alternative is to develop a seasonality index to apply to forecast consumption, in order to obtain monthly consumption that accounts for seasonal variation. Seasonality indexes should be applied at the supply planning step, not the forecasting step.

Developing a Seasonality Index

To develop a seasonality index, historical consumption data are needed. The higher the quality of data (in terms of completeness, accuracy, and number of years of data available), the more sound the seasonality indexes. Monthly consumption data[2] (as opposed to quarterly) are ideal to identify the detailed trend of consumption over a year. Each month will have a specific seasonality index.

To determine the index for each month, start by selecting a reference month. Then divide each month's consumption into that reference month. The result is a ratio. These ratios capture the general shape of the annual consumption pattern, and give the relationship of consumption in a particular month to that of the reference month. Figures 1 and 2 are actual historical consumption figures, with data showing a spike in consumption around May and June, and another spike in consumption in November and December.





To develop the seasonality indexes, June was selected as the reference month. Consumption for every month was divided by the reported consumption in June. Figures 3 and 4 show the seasonality indexes developed from that consumption data. For each product, the same trends in terms of peaks and valleys can be seen. These seasonality indexes show that for artemether/lumefantrine 6 x 1, for example, the consumption in November is about 2.5 times the consumption in June.

[2] Consumption data provide information about the quantity of goods actually given to or used by customers. Consumption data are collected at service delivery points (SDPs) and are an essential data item to a Logistics Management Information System (LMIS)

Figure 3. Seasonality Index (year 1)

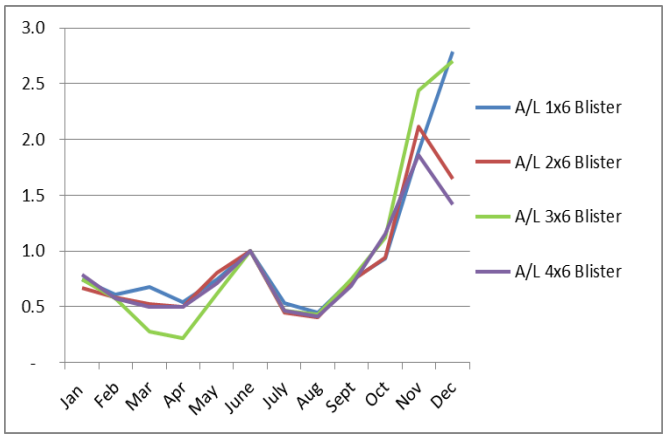
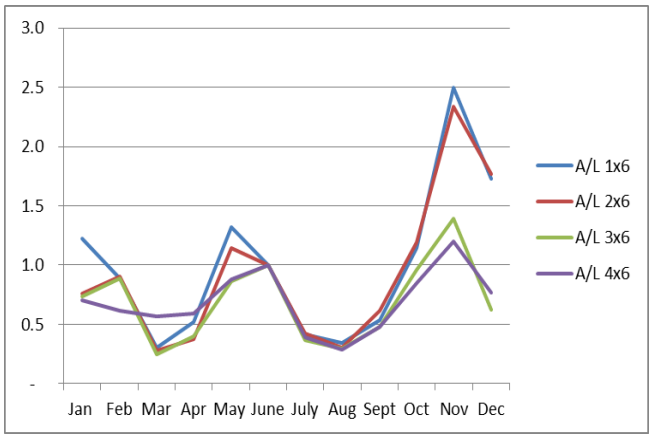
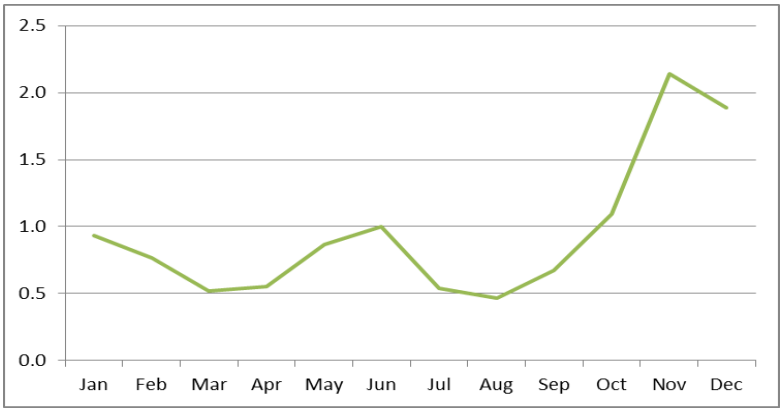


Figure 4. Seasonality Index (year 2)



To develop a final seasonality index, the indexes across products, from Year 1 and Year 2 were averaged, as shown in figure 5.

Figure 5. Seasonality Index - final



Again, key to developing a sound seasonality index is the availability of quality consumption data. Seasonality indexes can still be developed where there are data quality concerns; however, the index is only as good as the data that is used to develop it. Seasonality indexes do not necessarily have to be monthly. Quarterly data can also be used, if that is the only data available. Seasonality indexes can also be developed for each commodity type (for example, one could be developed for ACTs and another could be developed for RDTs), if it is appropriate to the context.

Applying the Seasonality Index to Forecast Consumption

The next step is to apply each month's seasonality index to the annual forecast consumption. This will result in an annual forecast consumption that considers the seasonal variation in historical consumption. Figure 6 shows forecast consumption using AMC. Figure 7 shows annual forecast consumption after the seasonality index has been applied.

Figure 6. Forecast consumption (No Seasonality Index)

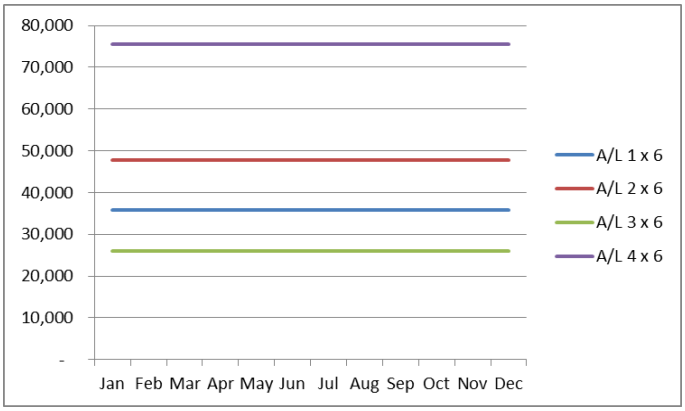
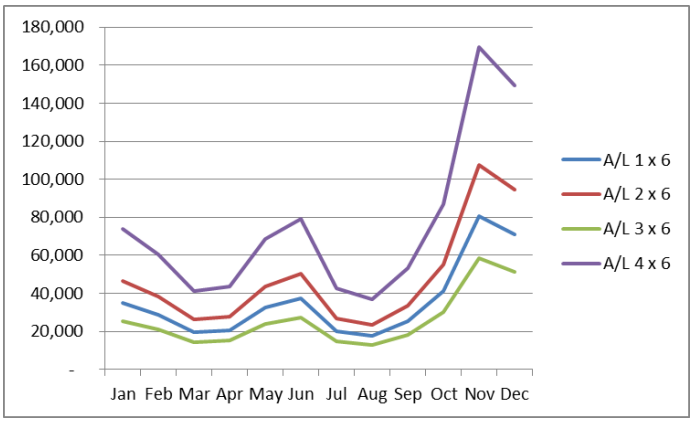


Figure 7. Forecast Consumption (Seasonality Index)



Scheduling Shipments According to the Seasonality Index

In the supply planning step of quantification, shipments should be scheduled to arrive when the national MOS hits the minimum stock level, and the quantity of each shipment should bring the MOS back up to maximum. Using a forecast that takes into account seasonality, however, program managers can plan shipments to arrive prior to the expected spikes in consumption. In some cases, this can mean that products should arrive two months before the expected spike in consumption, allowing for time for the commodities to move from the central level down to the service delivery points. Similarly, large shipments should not arrive in advance of known decreases in consumption during non-peak transmission when they are not needed, thereby mitigating potential overstock and expiry.

PipeLine is a best-in-class desktop software tool that helps program managers plan optimal procurement and delivery schedules for health commodities, and it monitors orders throughout the supply chain. PipeLine calculates MOS into the future, existing stock on hand, current consumption, and upcoming shipments. By entering in forecasted monthly consumption, which accounts for seasonality, users can schedule the appropriate quantities to arrive at the right times.

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