Simple indicators for projecting short-term dental market fluctuations

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ABSTRACT

Background. There have been fluctuations over time in dental care expenditures in the United States. This project aims to develop simple indicators that are easily available to people and that can be useful to predict short-term market fluctuations.

Methods. The authors analyzed data concerning 30 variables for the period of 1980 through 2012 for correlations with dental care expenditures during that period, looking for factors that historically moved in a highly correlated manner, either positively or negatively, with dental care expenditures. The authors lagged the factors to determine their potential predictive value for dental care expenditures.

Results. Personal consumption expenditures and gross domestic product emerged as valid leading indicators for predicting short-term dental market fluctuations.

Conclusion. Two simple measures that are easily available to dentists and others can serve as indicators of short-term fluctuations in the dental marketplace. Their validity as indicators can, and should, be monitored regularly.

Practical Implications. These indicators can be of significant value for practitioners in being alerted to potential market changes and planning to accommodate these changes. Combined, these factors can tell what changes are coming and when they have arrived.

Key Words. Dental care use; dental economics; dental health.

JADA 2015:146(12):913-918

http://dx.doi.org/10.1016/j.adaj.2015.06.005

Expenditures for dental care in the United States generally have been increasing for many years; however, there have been periods when decreases in expenditures from the prior year have occurred.[1] For example, total inflation-adjusted dental care expenditures were reduced in 2008 and 2009 and remained flat through 2013 whereas per capita expenditures also decreased during that period and continued to decrease through 2013.[1] The Centers for Medicare and Medicaid Services (CMS) produces estimates of annual estimates of health care expenditures, including dental care expenditures.[2] Since 1997, CMS has produced projections of short-term health care spending in the National Health Expenditure Accounts annually, including dental care expenditures.[3] These projections have not been practically helpful for the average practitioner in predicting meaningful short-term economic movements within the dental care sector. Moreover, results from a 2015 analysis of these projections showed that CMS projections for dental care expenditures were not as accurate as projections for other sectors of the health care system.[4]

Investigators in previous studies have looked at growth in dental care expenditures compared with overall growth in the US economy. Investigators in 1 study reported that from 1950 to 1986 the annual rate of growth in dental care expenditures was faster than the growth rate of the US economy.[5] The authors concluded that dentistry was a "growth industry." Investigators in other studies have compared the growth in dental care expenditures with that in other sectors of the US economy. From 1950 to 1982, the dental sector of the economy grew at a faster rate than did other health service sectors, including physician services.[6] Investigators in a study of trends in consumer spending from 1970 to 1988 reported that dental care expenditures grew faster than expenditures on food and clothing but that they grew at a slower pace than expenditures on physician services.[7]

Investigators in several studies have looked to the stock market for indications of future economic trends in the dental sector by analyzing companies that do business in dentistry or with dentists.[8,9] Some have developed dental indexes of varying complexity to assist in an analysis of this sector.[10,11] None have identified a small number of simple indicators that are readily available to people and that can be useful in predicting short-term fluctuations in the dental market.

We analyzed trends in dental care expenditures and related variables, but the focus of our analysis was different. We were seeking to identify potential simple leading indicators that could aid in forecasting short-term economic changes in the dental health care sector. Although our focus was different from that in previous studies, we were guided by these studies in our search for leading indicators. Advance indication that changes are likely to occur in dental care expenditures could be of great assistance to practitioners and to other participants

in the dental care system. We did not aim this study at increasing the accuracy of the existing numerical projections but rather at identifying patterns of change in other sectors that closely approximate those in the dental sector that can be predictive of future movement in the level of dental care expenditures.

METHODS

We obtained estimates of annual dental care expenditures from the CMS.[1] We focused on the period from 1980 to 2012, the most recent year for which data are available (data for 2012 were released January 6, 2014). *Dental care expenditures* refer to expenditures for dental services delivered in a dental practice setting.

We searched several data sources, particularly from the US Department of Labor Bureau of Labor Statistics, the US Department of Commerce Bureau of Economic Analysis, and US Census Bureau, looking for factors that historically moved with dental care expenditures in a highly correlated manner, either positively or negatively. We used the Pearson correlation coefficient to measure the linear relationship between dental care expenditures and other variables. This statistical measure of association takes on a value between −1 and 1. The further the value of r is from 0, the stronger the relationship between the 2 variables.

We considered 30 variables, and the table[12-24] describes these variables further. All estimates of expenditures are expressed in terms of dollar amounts in the year under discussion (no inflation adjustments were made). In selecting factors to examine, we did not consider a cause-and-effect relationship between these factors and dental care expenditures movement. We were not seeking to explain causal relationships but to predict movements in dental care expenditures.

As a first step, we examined correlations over time between the 30 variables and dental spending. We retained the variables that displayed a significant correlation coefficient. We then lagged these explanatory variables and tested their correlation with dental care expenditures. An example may serve to explain what we mean by *lagging*. Let us say that we are looking at the relationship between dental care expenditures and personal consumption expenditures (PCE). Instead of using current estimates of both variables (for example, 2010 dental care expenditures and 2010 PCE), we focus on the relationship between 2010 dental care expenditures and 2009 PCE, and we do this for every year in the series. We then compute the correlation coefficient between the dental care expenditures and PCE lagged 1 year. If this correlation coefficient remains strong, or even stronger, that finding suggests that the PCE for a given year is a good predictor of dental care expenditures the following year. We were seeking to identify factors that remained highly correlated with dental care expenditures when lagged because such a factor could be a good candidate for predicting dental care expenditures 1, 2, or 3 years in advance. All correlation coefficients specified in the text of the Results section were statistically significant at the $P < .0001$ level.

RESULTS

The table presents the results of our scan of potential indicators with the calculations of their correlation coefficients with dental care expenditures. We started by looking at the relationship between dental care expenditures and gross domestic product (GDP) and then looked at the relationship between dental care expenditures and various components of GDP. We widened our search by examining factors such as consumer sentiment and unemployment.

Two factors investigated fulfilled the 2 criteria we established for validity as a leading indicator for predicting future fluctuations in the dental market: a strong correlation with dental care expenditures and a correlation that maintains its strength or strengthens further over time. These 2 factors are the GDP and PCE.

As Figure 1 shows, GDP movements expressed in terms of annual growth rates are almost concurrent with changes in dental care expenditures, sometimes leading and sometimes trailing dental care expenditures, but generally in the same direction. The correlation between movements remains strong and increases with lagged comparisons: with no lag, $r = 0.997$ ($P = .01$; 95% confidence interval [CI], 0.993-0.998); with 1-year lag, $r = 0.998$ ($P = .01$; 95% CI, 0.995-1); and 2-year lag, $r = 0.998$ ($P = .01$; 95% CI, 0.995-1) (Table).

As Figure 2 shows, movements in PCE expressed in terms of annual growth rates also track closely with dental care expenditures. The correlation remains strong as a time lag is introduced into the data: with no lag, $r = 0.998$ ($P = .01$; 95% CI, 0.996-1); with a 1-year lag, $r = 0.999$ ($P = .01$; 95% CI, 0.997-1); and with a 2-year lag, $r = .998$ ($P = .01$; 95% CI, 0.996-1). During the years 1991 and 1992, an anomalous situation occurred that we cannot explain. The expenditures moved in opposite directions, returning to near equality in 1993.

DISCUSSION

GDP is defined as the value of the production of goods and services in the United States.[16] A priori, one might expect changes in dental care expenditures over time to be related closely to changes in overall economic activity. PCE[15] is the primary measure of consumer spending on goods and services in the US economy. It accounts for approximately two-thirds of domestic final spending, and, thus, it is the primary engine that drives future economic growth. PCE includes expenditures financed

ABBREVIATION KEY. **CMS:** Centers for Medicare and Medicaid Services. **GDP:** Gross domestic product. **PCE:** Personal consumption expenditures.