Brief Original Report

Do celebrity cancer diagnoses promote primary cancer prevention?

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ARTICLE INFO

ABSTRACT

Objective. Celebrity cancer diagnoses generate considerable media coverage of and increase interest in cancer screening, but do they also promote primary cancer prevention?

Methods. Daily trends for smoking cessation-related media (information-availability) and Google queries (information-seeking) around Brazilian President and smoker Lula da Silva's laryngeal cancer diagnosis announcements were compared to a typical period and several cessation awareness events.

Results. Cessation media coverage was 163% (95% confidence interval, 54–328) higher than expected the week after the announcement but returned to typical levels the second week. Cessation queries were 67% (95% confidence interval, 40–96) greater the week after Lula's announcement, remaining 153% (95% confidence interval, 121–188), 130% (95% confidence interval, 101–163) and 71% (95% confidence interval, 43–100) greater during the second, third, and fourth week after the announcement. There were 1.1 million excess cessation queries the month after Lula's announcement, eclipsing query volumes for the week around New Years Day, World No Tobacco Day, and Brazilian National No Smoking Day.

Conclusion. Just as celebrity diagnoses promote cancer screening, they may also promote primary prevention. Discovery of this dynamic suggests the public should be further encouraged to consider primary (in addition to the usual secondary) cancer prevention around celebrity diagnoses, though more cases, cancers, and prevention behaviors must be explored.

Introduction

Celebrity cancer diagnoses spawn considerable attention and promote cancer screening (Noar et al., 2013). British television star Jade Goody's cervical cancer diagnosis corresponded with a 43% increase in Pap smear appointments (MacArthur et al., 2011; Metcalfe et al., 2010). Australian singer Kylie Minogue's breast cancer diagnosis stimulated a 40% increase in mammography appointments (Chapman et al., 2005). American President Ronald Reagan's colon cancer surgery was followed by a 400% increase in colon cancer inquiries to a national hotline (Brown and Potosky, 1990). But do public figures' cancer diagnoses also promote primary prevention, such as smoking cessation?

Celebrity diagnoses have not been linked to cancer prevention behaviors because of meager public health surveillance. Primary cancer prevention is usually assessed via annual telephone surveys reporting the proportion exposed to primary prevention messages or contemplating behavior change. However, these annual databases cannot be linked to external events occurring over a short timeframe, let alone a specific day (Ayers et al., 2011a,b, 2012b, 2013c). By monitoring daily media coverage of and Internet search queries for primary cancer prevention, it is possible to assess both how population primary prevention behaviors are primed (information-availability) and how populations contemplate (information-seeking) behavior change in response to a discrete societal stimulus.

On 29 October 2011 former Brazilian President Lula da Silva announced he had been diagnosed with laryngeal cancer, an illness he attributed to smoking (Economist, 2011). Because of this specific link, Lula's announcement was an unusual prompt to quit for the 22% and 13% of Brazilian men and women who smoke (WHO, 2011). As a result, we used this case to explore the potential link between a public figure's diagnosis and population primary cancer prevention, aiming to discover if such a link is plausible.

Methods

Cessation media coverage (information-availability) was indicated by daily stories archived on Brazil's *Google News* that mentioned quitting smoking (news.google.com.br), capturing Portuguese language newspapers/magazines and broadcast/cable networks, including online and print content. Stories mentioning cessation were monitored relative to all stories (i.e., the number of articles containing "parar de fumar" ("stop smoking"), divided by the number of stories containing "o" ("the"), reported per 100,000 each day). Each story occurring on a separate web address was counted, which can include the same text presented in separate outlets.

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Cessation queries (information-seeking) were indicated by daily trends for Google searches about cessation using *Google Trends* (google.com/trends). With this data it is possible to directly observe the thoughts of the searcher by the content of the query and that the searcher is taking some action toward behavior change. Queries that included the root phrase "parar de fumar" in Brazil (e.g., "como parar de fumar" – how to stop smoking) were monitored relative to all queries each day (i.e., relative search volume (RSV), where RSV = 100 is the day with the highest search proportion, and RSV = 50 is a day with 50% of that highest proportion). To demonstrate practical significance, the absolute number of unique cessation searches was estimated for the 50 most common queries that included "parar de fumar" obtained from *Google Adwords* (adwords.google.com).

An interrupted time series (Lewis-Beck, 1986) was used to estimate differences in the outcomes after Lula's announcement compared to a typical period (the mean from 2008 through 2011) after removing the data from New Years Day, World No Tobacco Day and Brazil National No Smoking Day weeks (the day of and 3 days before or after). Media and search volume after the announcement were also compared to the 3 former events, by comparing search volume around Lula's announcement to the week of each event from the same year (2011). For all four regressions, the difference between Lula and the comparison period was modeled as a percent increase $((\hat{\beta}_{\text{Diagnosis}} - \hat{\beta}_{\text{Event}})/\hat{\beta}_{\text{Event}})$. Confidence intervals (alpha = 0.05) were simulated using a bootstrap from the sampling distribution (King et al., 2000).

Results

Cessation media rose to 40 stories per 100,000 the day of Lula's announcement, peaking at 90 stories per 100,000 the next day, compared to a typical daily trend ranging between 0 and 20 stories per 100,000 (Fig. 1). Cessation queries began deviating from pre-diagnosis trends after cessation coverage spiked, increasing to their highest ever-observed (since 2004) volume 8 days after the announcement (RSV = 100).

Statistically, cessation media volume was 163% (95% CI, 54–328) higher than expected the week after Lula's announcement, but returned to typical levels the second, third and fourth weeks after. This short-lived surge in cessation media translated into 67% (95% CI, 40–96) excess cessation queries the first and 153% (95% CI, 121–188) the second week after the announcement. Cessation queries also remained significantly higher the third (130%; 95% CI, 101–163) and fourth week (71%; 95% CI, 43–100) after the announcement. Aggregating over the entire month, queries were 107% (95% CI, 88–128) higher, amounting to roughly 1,100,000 more cessation queries for *the 50 most common* queries including the root terms "parar de fumar."

Spikes in cessation media and cessation queries around Lula's announcement were also larger than Brazil's major cessation awareness events from the same year (Fig. 2). Descriptively, cessation media the day after Lula's announcement (90/100,000) was 300% greater than New Years Day (28/100,000), and about 200% greater than National No Smoking Day (50/100,000) or World No Tobacco Day (46/100,000). Similarly, cessation search queries were also higher. On World No Tobacco Day cessation queries peaked at 71% (i.e., 71 RSV) of the peak relative volume around the announcement, followed by National No Smoking Day at 67% and New Years Day at 35%.

Cessation search queries the week after and the second week after Lula's announcement were 77% (95% CI, −2 to 201) and 72% (95% CI, 39–106) greater than New Years Day week (the day of and 3 days before or after), and remained significantly higher for the third and fourth week after the announcement. Cessation queries were statistically
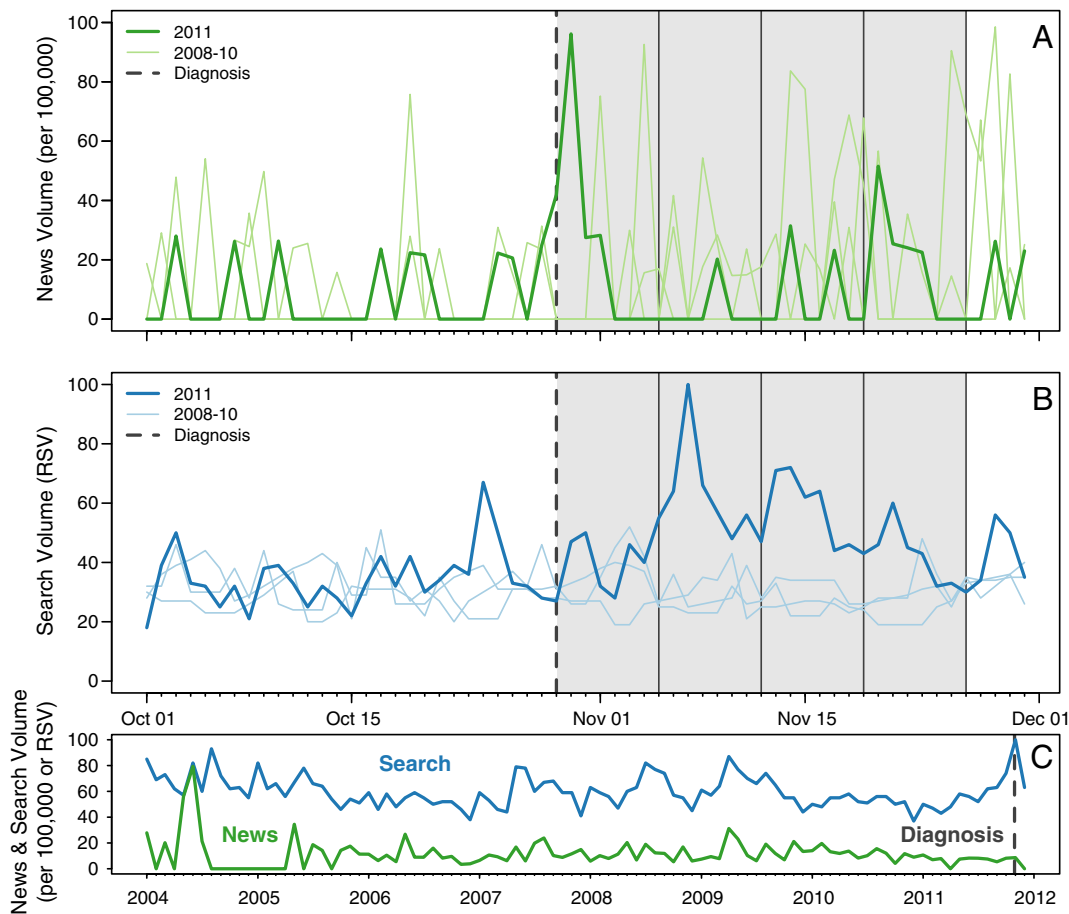

Fig. 1. Time-trends around President Lula's cancer diagnosis and other years. Note: Each panel shows time-trends for cessation media and cessation search queries around Lula's cancer diagnosis, including time trends for the same period from prior years. (A) Daily time series for media coverage of cessation by day, (B) daily time series for aggregate Internet search queries for cessation by day, (C) historic weekly aggregated time series for media and search since 2004. The shaded gray regions are 1, 2, 3 and 4 weeks after the diagnosis.