



Television is More Effective in Bringing Behavioral Change: Evidence from Heat-Wave Awareness Campaign in India

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Summary. — This paper analyzes a unique data set that details the daily advertisements on Information, Education and Communication (IEC) material to avert heat stroke mortality in different media used by the state government of Odisha, India and the actual daily heat-wave mortalities in the state over a period of eight years. The paper then investigates the relative effectiveness of the different media in reducing mortality econometrically. The government adopted awareness generation as an adaptation strategy for heat waves in the year 2003 and intensified the use of public media from 2007 when multiple newspapers and radio and television channels were used for dissemination. I analyze the district-level daily death occurrences due to heat stroke using both linear and non-linear econometric models. Media used on the same day or on previous days are represented in the models by grouping them as either print, audio or video media. The data used is a daily panel data set consisting of only summer days (15th March–20th June) for the years 2005–12 for each of the 30 districts of the state. The estimated models account for the gap in data and the multidimensional nature of the panel (days, months, years). The results show the repeated use of video media to be the most effective in reducing deaths followed by newspapers and radio. The paper's novel contribution is the use of secondary data to evaluate media and compare media effect of public health communication strategies in a developing country.

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Key words — climate change adaptation, daily panel data, heat waves, media use, awareness campaign, public health communication

1. INTRODUCTION

Heat waves are defined as “a periods of unusually hot dry or hot humid weather compared to a threshold value near the upper ends of the range of observed values of the variables in the region and lasts for, at least, 2–3 days” (IPCC, 2012; McGregor, Bessemoulin, Ebi, & Menne, 2010). It is being regarded as a persistent calamity taking many innocent lives in both developed and developing countries (IPCC, 2014). Regional and national governments have devised many responses to this crisis such as sponsorship of research (Euro-Heat Project), heat warning, activation of social and health networks, public education, etc., to enable people to adapt to this warming scenario (Ebi, Teisberg, Kalkstein, Robinson, & Weiter, 2004; Matthies, Bickler, Marin, & Hales, 2008).¹ From among the South Asian regions, central and south eastern India and central parts of Pakistan have been witnessing high casualty from heat waves in recent years (Jaswal, Rao, & Singh, 2015; Mueller, Gray, & Kosec, 2014; Panda *et al.*, 2014). Whereas governmental response to this calamity have been ad-hoc and incidence specific in most of these areas, two of the Indian state governments have come up with systematic heat-wave management action plans. The state government of Odisha is managing heat waves with a well executed awareness program that started in 2003 under the disaster risk management project in the state and the government of Gujarat has been running a heat action plan in city of Ahmedabad since 2013 after the city witnessed high casualties during 2010 heat waves (Azhar, Mavalankar, Nori-Sarma, Rajiva, & Dutta, 2014; Das & Smith, 2012; Wilkinson & Peters, 2015). This study focuses on the awareness program of Odisha government.

The State of Odisha in eastern India has been witnessing regular casualties from heat waves since 1998. This new climatic phenomena, probably an indicator of the ongoing climate change, cripples the state in summer months and has

forced the government to enact various adaptation measures. Thus, today, heat-wave management constitutes an important and regular disaster management activity in the state.² One of the core activities is health education and awareness generation through the dissemination of information, education and communication (IEC) material on heat waves to bring behavioral changes so that people expose less to heat. The paper evaluates the media used for dissemination of these IEC materials.

There is evidence that health education brings improved health outcomes through behavioral change (Glanz, Rimer, & Viswanath, 2008; Hornik, 2002). Studies have shown a positive effect of such interventions on health behavior in cases like smoking habits, cholesterol consumption, condom use, immunization of children, or simply better knowledge on different aspects of health etc. (Balraj & John, 1986; Robinson *et al.*, 2014; McCombie, Hornik, & Anarfi, 2002; Pierce, Macaskill, & Hill, 2002; Roccella, 2002). Providing information, whether in the form of Public Health Communication

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(PHC) or as a policy instrument, has been considered a powerful tool for bringing about behavioral changes in people (Bruns, Filmer, & Patrinos, 2011; Hornik, 2002; World Bank, 2004). Knowledge or information on threats to life (i.e., awareness of threat, benefit of avoidance, etc.) are also determinants of the health outcome as they motivate people to take precautions against health risks (Jalan & Somanathan, 2008; Madajewicz *et al.*, 2007; Pattanayak & Pfaff, 2009). Thus, awareness generation on heat waves should motivate people to take precautions in the form of defensive activities or changes in behavior that can result in positive health outcomes. People in underdeveloped countries are constrained from all directions; a position described as a typical “starting-at-origin” position by Pattanayak and Pfaff (2009) and may not have the capacity to spend extra on averting activities. However, with repeated information from PHC programs, they may be motivated to reallocate resources to weather-friendly consumption goods or reallocate time to activities that minimize exposure to extreme weather conditions. Inducing such behavioral changes in people, however, is challenging as behavioral changes occur slowly, processing of information could vary from individual to individual, and media accessibility may vary from region to region. Thus, there is need to make PHC messages convincing, catchy, in local vernacular, and disseminate such information repeatedly through different media so that it reaches maximum people and people understand it. This explains why PHC program messages are disseminated repeatedly over years and why different types of media are involved in dissemination. Theories such as Max Weber’s “social action theory”, and George Gerbner’s “cultivation theory”, developed in the field of media studies confirm that media audiences do construct meanings from the content they perceive and, thus, persistent exposure to media does have a measurable effect on the perception of the audience (Anderson & Meyer, 1988; Gerbner, 1998).

In the state of Odisha, heat-wave-related mortality has come down though severe heat-wave conditions still prevail (Das & Smith, 2012; also see Section 2) and the awareness programs could be having some impact on mortality by bringing about changes in public behavior. The paper econometrically examines whether the decline in mortality is linked to media use and if so, use of which media depicts the most consistent and strongest effect. Moreover, this paper evaluates the efficacy of individual media, on which the literature is comparatively limited. Both traditional (newspaper, radio, television, poster, pamphlet, etc.) and social media (Face book and Twitter) have been used to promote health education, but media evaluation studies have focused mostly on interventions based on traditional media and have evaluated the aggregate effect of different media used. Despite the limited research on efficacy of individual media, there is some evidence that television and radio are usually more effective in terms of reach and message recall than newspapers (Newbold & Campos, 2011). The present results will add to such knowledge.

There is also limited research evaluating the impact of media on public health education programs in underdeveloped countries and this research will make an important contribution to the subject. Compared to sample based evaluation studies, this paper is based on the entire population, not just a representative sample. The secondary data on the entire state population like district-level daily mortalities due to heat waves, and other district-level information like population, maximum temperature, humidity, net domestic product, forest cover, media ownership, media penetration etc. are used in the analysis. The results thus are free from any sampling bias and this is another significant feature of the study.

The rest of the paper is organized as follows: Section 2 describes the heat-wave-related state interventions including awareness campaigns in Odisha; Section 3 discusses the methodology; Section 4 describes the data and definition of media variables, Section 5 presents the estimation issues, and Section 6 presents the results and discusses their implications. Section 7 concludes the study highlighting the caveats and the issues to be researched further.

2. ODISHA HEAT-WAVE AWARENESS CAMPAIGN

The state of Odisha in eastern India witnessed unprecedented heat waves in year 1998 which resulted in a calamity situation killing 2,042 people (Das & Smith, 2012). After this year, heat waves during summer have become a regular feature in the state and another 980 people have succumbed to heat stroke in during 1999–2012 as per government report. The alert state government has implemented a systematic heat-wave management plan since 2003 that includes an awareness campaign on dos and don’ts during heat waves and some success with regard to this heat-wave management is discernible. Year 1998 was an outlier year as heat waves were so strongly experienced in the state for the first time. Ignoring 1998, one finds deaths per heat-wave day going up from 1999 till 2005 and then coming down systematically though the number of heat-wave days has remained at an all-time historical high (see Table 1 and Figure 1).³ The details of the deceased, which were available only from 2005 onward from the government, depict some clear features. In during 2005–12, 644 people have died, of which 77% were male, with roughly 85% being 40 years of age or above and 52%, being 60 years of age or above. More than 80% of deaths occurred during the months of May and June, the timing attesting the combined effect of temperature and humidity on health as the study area

Table 1. Heat-wave days and heat-wave deaths in Odisha

Year	Heat-wave days (HWD)*	Deaths due to heat waves	Average deaths per HWD
1998	28	2042	72.9
1999	25	91	3.6
2000	18	29	1.6
2001	12	25	2.1
2002	21	41	2.0
2003	28	68	2.4
2004	8	45	5.6
2005	29	236	8.1
2006	4	21	5.3
2007	8	47	5.9
2008	12	68	5.7
2009	29	85	2.9
2010	38	100	2.6
2011	12	22	1.8
2012	30	61	2.0

*Heat-wave days are counted using the heat-wave day definition of India Meteorological Department as used by the National Disaster Management Authority (NDMA), Government of India. NDMA declares heat-wave and severe heat-wave days depending on the normal summer temperature of the area. If normal summer temperature of an area is:

- Less than 40 °C, increase in temperature by 5 °C or 6 °C is called heat wave and increase by 7 °C or above is called severe heat wave.
- Equal or more than 40 °C, increase in temperature by 4 °C or 5 °C is called heat wave and increase by 6 °C or above is called severe heat wave.

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