Field-Effects of Consciousness: A Seventeen-Year Study of the Effects of Group Practice of the Transcendental Meditation and TM-Sidhi Programs on Reducing National Stress in the United States

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Abstract

Many conceptions of field-effects of consciousness have been proposed. The most well-developed of these is Maharishi Mahesh Yogi's, which holds that every individual in society, whether stressed or coherent, contributes to collective consciousness. Collective consciousness in turn impacts the life of every individual, guiding the trends of life in the nation. Over 600 studies have documented that the Transcendental Meditation® and advanced TM-Sidhi® program increase coherence in the individual, as indicated by improved brain integration, health, cognitive abilities, and behavior. Fifty additional studies indicate that these more coherent individuals radiate an influence of coherence throughout society, as reflected in reductions of conflicts and improvements in quality of life. In the present study, interrupted time series analysis was used to evaluate the effectiveness of this population-level health intervention that was implemented at a clearly defined point in time. It found that during the Demonstration period of 2007-2011, compared to the Baseline period of 2000 to 2006, when a group practicing the Transcendental Meditation and TM-Sidhi techniques reached or exceeded a predicted required threshold of √1% of the U.S. population (1725) there were significant and meaningful trend reductions in indicators of national stress: homicides, rape, aggravated assault, robbery, infant mortality, drug-related deaths, motor vehicle fatalities, fatalities due to injuries in youths ages 10-19, and in a composite index of all eight variables (p's < .0001). Moreover, from 2007 to 2016, when the size of the group decreased to below the required threshold, all stress indicators increased again. Potential alternative explanations in terms of changes in economic conditions, political leadership, population demographics, and policing strategies could not explain the results. The results support a new highly practical field-theoretic understanding of social dynamics.

Keywords: consciousness, stress, collective consciousness, social indicators, Transcendental Meditation

1. Introduction

Throughout history, leading philosophers, social scientists, and physicists have expressed the idea that the universe is fundamentally a transcendental field of consciousness (Nader, 2021). In this view, all humans and everything else are interconnected through the field. Moreover, this paradigm holds that the silent level of transcendental consciousness experienced by the human mind is the direct experience of the field. Maharishi posits that this experience is the most effective means to create harmony in ourselves and the entire animate and inanimate nature to create positive social change (Maharishi Mahesh Yogi, 1963).

The ancient Vedic seers, Rishis, of India, said "The Truth is one, the wise call it by different names." In the Vedic tradition, the unified field of consciousness is called *Atman, pure existence (Sat), pure consciousness (Chit),* and *bliss (Ananda)* as well as by many other names. In ancient China it appears as the *Tao,* the harmony of the natural order of the universe. In the Hermetic tradition of Egypt, it is called the *one Soul*, the *Soul of the Cosmos*. In Plato's philosophy, it is called the *One, the Good, the Beautiful*, and it is referred to as *Being* by Plato's student Aristotle. It has been called the *Kingdom of Heaven Within* in the Christian tradition, as *the Absolute* by philosopher Hegel, as the

Eternal Silent Mind by the English poet Wordsworth (Chandler, 2019; Pearson, 2012), and as the *Oversoul* and *Self of all Beings* of the American Transcendentalists, Emerson, Thoreau, and Whitman (Anderson, 2010). Leading physicists have reasoned that the unified field of Einstein and superstring theory of contemporary quantum field theory are referring to this same reality (Greene, 2003; Hagelin, 1987, 2019).

In the social sciences, Emile Durkheim coined the term *conscience collective* as the mind of society as a whole, and describes the collective mind as composed of deeply held collective values and cultural practices that determine cultural identity and guide social behavior (Durkheim, 1951). Carl Jung postulated a *collective unconscious* as the repository of the collective memories of humanity, which are manifest cross-culturally as the universal symbols and archetypes that guide individual and social evolution (Jung, 1959).

Contemporary concepts of people influencing each other at a distance through field-effects of consciousness have been researched in medicine and psychology, including studies of the *biofield* supported by NIH (Rubik, Muehsam, Hammerschlag, & Jain, 2015), extensive research on remote perception, remote healing, and interindividual influences (Radin, 1997; Radin, Schlitz, & Baur, 2015; Schlitz & Braud, 1997; Schmidt, Schneider, Utts, & Walach, 2004). Studies of near-death experiences support the perennial philosophy that consciousness is a self-existent field that exists independently of the body (Kelly, 2017; Kelly, Crabtree, & Marshall, 2015; Kelly, Kelly, Crabtree, Gauld, & Grosso, 2007). More than twenty years of research at The Global Consciousness Project of the Princeton University Engineering Anomalies Research Lab has provided evidence for the existence of global consciousness (Nelson, 2019, 2021). For a review of the field paradigm and evidence for it, see (Orme-Johnson & Fergusson, 2018).

2. Maharishi's Theory of Collective Consciousness

Maharishi Mahesh Yogi has developed an understanding of *collective consciousness* from the Vedic tradition of India (Maharishi Mahesh Yogi, 1986b). Maharishi (1977b) explains:

> Just as the consciousness of an individual determines the quality of his thought and behavior, so also there exists another type of consciousness for society as a whole; a collective consciousness for each family, city, state, or nation, having its own reality and the possibility of growth. The quality of collective consciousness of a society is a direct and sensitive reflection of the level of consciousness of its individual members. . . . Individual consciousness influences all these levels of collective consciousness and is in turn influenced by it. (p. 2)

Thus, the individual is considered the basic unit of collective consciousness, and the collective influence of individuals, whether stressed or coherent, is the prime mover of social dynamics. Maharishi (1979) adds:

> All occurrences of violence, negativity and conflict, crises, or problems in any society are just the expression of growth of stress in collective consciousness. When the level of stress becomes sufficiently great, it bursts out into large-scale violence, war, and civil uprising necessitating military action. (p. 38)

Moreover, government is described as the "innocent mirror" of collective consciousness. Whatever the type of government or the personal attributes of its leadership, the dynamics of society and the government are ultimately driven by its collective consciousness, which reciprocally depends on the level of stress or coherence of the individuals in the population (Maharishi Mahesh Yogi, 1986b).

2.1 Creating Coherence in the Individual to Create Coherence in Collective Consciousness

In Maharishi's approach, the solution to reducing stress in collective consciousness is to train enough people in society to experience transcendental consciousness. This is explained in the Vedic literature by the ancient Vedic sage Patanjali, who says that the way to experience the universal level of consciousness is to allow the fluctuations of the mind to settle until, transcending the finest thought, transcendental consciousness, *yoga*, the union of the individual mind and the unified field of consciousness is gained (Egenes, 2010). As a result, hostile tendencies are said to be eliminated in the environment (Egenes, 2010, verse 2.35).

2.2 Automatic Self-Transcending Meditation

There are three classes of meditation techniques, focused attention, open monitoring, and automatic self -transcending, which are distinguished from each other by their goals, what one does during them, and the EEG frequencies associated with them (Travis & Shear, 2010). The goal of Automatic Self-Transcending (AST) techniques is to transcend (go beyond) active cognitive processes to experience transcendental consciousness, the

silent mind. The Transcendental Meditation technique (TM®) is the most well-known example of AST. They are from the Vedic and Chinese traditions. They are associated with frontal dominant alpha1 (8-10 Hz) EEG.

By contrast, Focused Attention (FA) techniques involve control of attention to keep the mind focused on an object, such as a thought or some aspect of one's breathing. There are many variations of FA, including compassion meditation, Qigong, and some forms of Zen. Practicing focusing increases the ability to focus. Moreover, it is thought that when we give our attention to something, such as compassion, it becomes stronger in our life. FA is associated with the higher EEG frequencies of beta and gamma (13 to 50 Hz). It prevents transcending because it increases mental activity.

Open Monitoring (OM) (often referred to as mindfulness) involves directing dispassionate, non-evaluative awareness of ongoing experience. The goal of OM is to train the mind to be more aware of the present moment and not to react irrationally and emotionally to traumatic memories. The EEG frequency associated with OM is theta (4-7 Hz), known for its role in inhibiting external sensory distractions at the level of the thalamus while one is focusing on an internal mental task (such as monitoring one's thoughts). The frontal midline theta observed during OM appears to reflect monitoring of ongoing experience without high levels of control or manipulation of the contents of experience (Travis & Shear, 2010). The mental activity required to direct awareness to the stream of thought precludes the mind from becoming silent and transcending. Thus, different meditation techniques are quite dissimilar from each other.

The study in this paper used the most widely available and researched example of AST, the Transcendental Meditation technique (TM). TM has been taught worldwide in a standardized format by certified teachers since the early 1960's (Maharishi Mahesh Yogi, 1963, 1969, 1986a). During TM, one learns a suitable mantra and how to use it effortlessly. During the practice, the mind is automatically drawn inward via the mantra to subtler levels of the mantra. Transcending even the subtlest level, the mind experiences unbounded awareness, transcendental consciousness, bliss consciousness, said to be the fourth major state of consciousness (Maharishi Mahesh Yogi, 1963).

2.3 The Neurophysiology of Transcending

The alpha1 (8-10 Hz) EEG frequency in frontal cortical association areas seen during TM is correlated with inner awareness and mental quiescence (Travis, 2001; Wallace, 1970a; Wallace, Benson, & Wilson, 1971). Alpha1 in association areas appears to represent liveliness of the "screen of consciousness," providing a context for grouping isolated elements into the unity of experience (Travis & Shear, 2010). The experience during a session of TM practice may be characterized by repeated cycles of effortless movement of attention from the active thinking level to more abstract, subtler levels of thinking and then to a completely quiescent, wakeful state at the deepest level of mind, typically followed by movement of attention back to more active levels (Travis, 2001).

Transcending of mental activity to subtler levels of thought during TM is associated with a host of autonomic, metabolic, and neurophysiological changes (Travis, 2001). TM produces a unique state of "restful alertness", which is not seen in FA or OM meditations (Travis, 2001; Wallace, 1970b; Wallace et al., 1971). "Restfulness" is indicated by reduced respiratory rate, basal skin conductance, cortisol, plasma lactate and spontaneous skin resistance responses, while "alertness" is an inner awareness without thoughts or with greatly reduced thoughts, indicated by increased alpha1 EEG power and coherence (Dillbeck & Orme-Johnson, 1987; Orme-Johnson, 1973; Travis, 2001; Travis, Arenander, & DuBois, 2004;Travis et al., 2010; Wallace, 1970a; Wallace, 1972). Whereas FA is experienced as active mental processing, and OM as quieter mental processing, AST is characterized as the sequential reduction of processing that leads to a state in which mental processing decreases and the person experiences inner peace, transcendental consciousness (Maharishi Mahesh Yogi, 1963; Travis et al., 2010; Travis & Shear, 2010).

The fact that TM is a mental technique suggests that it integrates the brain through top-down processes, from cortical to subcortical. Travis and Wallace (1999) suggest a neural mechanism by which TM works. Firstly, in comparing TM with ordinary eyes-closed rest, they observed that TM produces a state fundamentally different from eyes closed rest, in which the breath rate and skin conductance are lower during TM, and respiratory sinus arrhythmia and alpha anterior-posterior and frontal EEG coherence are higher during TM. These results are achieved in the first minute of TM practice and are maintained throughout the TM session of 20 minutes. Travis and Wallace suggest two neural networks that may mediate these effects: 1) a "neural switch" in prefrontal areas inhibits activity in specific and non-specific thalamic structures and 2) a "restfully alert" state is maintained by a basal ganglia-corticothalamic threshold regulation, a mechanism that automatically maintains lower levels of cortical excitability.

Evidence indicates that the effects of TM arise from increased brain integration, on both the level of the cerebral cortex as seen as increased EEG coherence (Dillbeck & Bronson, 1981; Levine, Hebert, Haynes, & Strobel, 1977;

Orme-Johnson & Haynes, 1981a; Travis & Arenander, 2006; Travis & Wallace, 1999), as well as on the level of improved connectivity within the default mode network and limbic system (Avvenuti et al., 2020; Travis et al., 2010; Travis & Parim, 2017). This view that the benefits of TM arise from brain integration contrast to the theory that the benefits of mindfulness practices are based on cerebral cortical thickening (Grant et al., 2010; Lazar et al., 2005). The evidence so far indicates that TM practice does *not* increase cortical thickening, probably because it is effortless and does not require more neurons to support a new skill (Mahone, Travis, Gevirtz, & Hubbard, 2018). As Shear (2010) has pointed out, focused attention and open monitoring are "practice-makes-perfect" techniques. In these techniques, one practices skills (focusing of attention and maintaining a non-judgmental attitude towards experience) to gain mastery of them. To improve these skills, they are practiced, just as one would practice any other skill such as learning to type, play the piano or shoot basket balls. TM does not create a new skill, but is a "state enlivening" technique, which uses the natural inherent tendency of involuntary attention to effortlessly and automatically be drawn towards increasing charm, in this case towards the blissfulness of the transcendental state.

2.4 Normalizing Stress in the Individual: Increased "Coherence" in the Individual to Increase Coherence in Society

In Maharishi's (1986b) terminology, TM creates harmony in individual and collective life by "bringing it in accord with *the laws of nature*". In this view, natural law is not just value neutral, as it is generally thought of in modern science. Natural law is considered to have a positive valence, towards creating greater health, happiness, and harmony in society.

According to Maharishi, the basic law of nature of the mind is to seek levels of greater happiness and mental health. Research shows that TM practice facilitates this natural tendency, as indicated, for example, by meta-analyses showing that the TM practice is more effective than other forms of meditation and relaxation for reducing trait anxiety (Eppley, Abrams, & Shear, 1989; Orme-Johnson & Barnes, 2013; Sedlmeier, Eberth, Schwarz, Zimmermann, & Haarig, 2012).

These psychological changes are based on the body coming in more accord with natural law. The laws of nature of the body involve homeostatic feedback systems that maintain a steady state of internal, physical, and chemical conditions in the body necessary for life and health. Homeostatic systems continuously monitor levels of vital parameters such as blood pressure, heart rate, blood sugar, pH, and concentrations of sodium, potassium, and calcium ions among many other parameters. The system sends messages to control centers to amplify or dampen output of effectors to maintain the levels of these parameters in an optimal range for life and good health.

In the Bhagavad-Gita, a renowned text of the Vedic literature, the enlightened person is described as one "in whom these contacts (sensory experiences) do not disturb, who is even minded in pleasure and pain, steadfast…" (verse 2.15), "having become balanced in success and failure" (verse 2.48), and who is "freed from duality, ever firm in purity, independent of possessions, possessed of the Self" (verse 2.45) (Maharishi Mahesh Yogi, 1969).

This suggests that enlightenment is based on a highly efficient homeostatic system that maintains optimal balance in the body under the most challenging conditions. This hypothesis suggests many ways in which the growth towards enlightenment could be operationalized in terms of improvement in homeostatic systems, such as increased autonomic stability and rapid habituation to stress (Orme-Johnson, 1973; Travis et al., 2009) or improved blood pressure regulation (Alexander et al., 1996; Rainforth et al., 2007; Schneider et al., 2005; Schneider et al., 2012; Schneider et al., 1995).

Homeostatic systems, in coordination with the immune system, detect damage to the body and invading pathogens, and coordinate healing processes. Healing primarily takes place during sleep and dreaming. TM can be considered as adding a third kind of healing rest, the unique neurophysiological state of restful alertness. Research suggests that adding TM to the daily routine provides additional healing beyond what sleep and dreaming accomplish. This is indicated, for example, by global reductions in hospitalization and outpatient visits in the TM group compared to controls *in all categories of disease* and *in all age groups,* including reductions of 50% in children and young adults, and 69% in adults over 40 (Orme-Johnson, 1987; Orme-Johnson & Herron, 1993). Both TM and control groups had regular sleep and dreaming. Only the TM group had TM. Randomized controlled trials of TM as a treatment modality have demonstrated it reduces pathology in many of these disease categories, further validating the efficacy of adding TM to one's daily routine (Orme-Johnson, 2021). Improved health is one dimension on which citizens who learn to experience transcendental consciousness, and thus become more coherent, could be expected to radiate an influence of coherence into collective consciousness.

2.5 Reduced Substance Abuse

Another indicator of increased coherence in the individual is reduced substance abuse. Transcending through TM

reduces substance abuse by eliminating its roots, which are the physiological imbalances that motivate self-medication. Fatigue, anxiety, depression, and pain are examples of imbalances that motivate the consumption of stimulants, tranquilizers, anti-depressants, opioids and other analgesics, respectively. These substances are taken with the intention of creating a more optimal, happy internal state, in other words, more optimal homeostasis. Similarly, the quest for greater spiritual progress may motivate taking psychedelics, which can have unforeseen deleterious consequences. In contrast, the solution to substance abuse is achieving the deep rest gained through regular transcending, which quietly and automatically normalizes physiological imbalances and replaces cravings with a more blissful internal milieu and genuine spiritual growth (Alexander, Robinson, & Rainforth, 1994a).–

Meta-analyses have shown that the trajectory of other programs for drug, alcohol, and cigarette abuse typically follow a pattern of 100% abstinence in the beginning when the person is inspired to stop, which fades to only 10% abstinence after a year. In contrast, the trajectory of the TM program for all substances is a gradual decrease of drugs over the course of a year as regular meditation normalizes the stresses causing the abuse. These meta-analyses have found that the transcending approach through the TM technique is more effective than all other programs studied, including other relaxation programs, preventive education and educational programs (Alexander, Robinson, Orme-Johnson, Schneider, & Walton, 1994b).

2.6 Optimal Stress Response

As the body normalizes its stresses, the different homeostatic systems begin to function more in coordination with each other, resulting in a healthier, more resilient, and protective response to stressful life events. This is particularly useful for those who have abused substances due to stress, but also very valuable for those who are comfortable in their lives, but through the pace of modern living are faced with stressors as a fact of life.

Research indicates that TM meditators live a more relaxed lifestyle, as indicated, for example, by the studies showing that they have lower baseline levels than controls of major stress markers, such as respiration rate, heart rate, skin conductance, plasma lactate, and cortisol levels (Dillbeck & Orme-Johnson, 1987; Klimes-Dougan et al., 2019; Walton, Pugh, Gelderloos, & Macrae, 1995). When stressors do occur, the more well-rested TM practitioners show a more optimal orienting response, making more adaptive resources available to cope with the challenge. Studies also show that the TM practitioners' response to stress is a more efficient, simple physiological response (fewer secondary responses), requiring less energy. When the stressor is over, they recover more rapidly to baseline levels, not wasting adaptive resources on continually responding to stressors that have passed (Goleman & Schwartz, 1976; MacLean et al., 1997; Orme-Johnson, 1973).

Cardiovascular and pain responses to stressors become more efficient. For example, a randomized controlled trial found that two months of TM practice reduced systolic blood pressure, heart rate, and cardiac output responses to laboratory stressors in adolescents at risk for heart disease (Barnes, Treiber, & Davis, 2001). An fMRI neuroimaging study found that four-months of TM practice reduced the response of the brain to laboratory pain (finger in hot water) in the frontal cortex, thalamus, and anterior cingulate cortex, corresponding to reductions in cognitive, sensory, and emotional aspects of the pain response (Orme-Johnson, Schneider, Son, Nidich, & Cho, 2006). A related study showed that the sensory response to painful stimuli (how much it hurts) of TM subjects was similar to controls, indicating that they experienced the pain the same way as controls. But their distress response (how much it bothered them) was significantly lower than controls, indicating greater equanimity (Mills & Farrow, 1981).

Related, a neuroimaging study found that three months of TM practice reduced perceived distress, and that the reduction was associated with increased connectivity between two major components of the brain's default mode network in the limbic system: the superior parietal lobe and the precuneus. Both are involved in diverse sensory-motor processing, memory, and reflective self-awareness (Avvenuti et al., 2020). This study and the pain study indicate that the changes produced by TM practice in how pain and distress are experienced are more related to the emotional interpretation of pain and distress mediated by the limbic system, than to the sensory response to pain. These results give scientific evidence of the growth through TM of "equanimity in pleasure and pain, victory and defeat" as expressed in the Bhagavad-Gita (Maharishi Mahesh Yogi, 1969).

2.7 Brain-Based Benefits

The above research indicates that the psychological benefits of transcending through the TM technique are brain-based, resulting from restructuring of the nervous system on all levels, cerebral cortex, limbic system, and brain stem (Avvenuti et al., 2020; Mahone et al., 2018; Orme-Johnson & Haynes, 1981b; Travis & Parim, 2017; Yamamoto, Kitamura, Yamada, Nakashima, & Kuroda, 2006).

The regulation of the brain through TM is a top-down process, in which improved integration of frontal cortical executive areas regulates the activity of the lower limbic "emotional" areas. For example, it is known that loss of frontal executive control over the amygdala results in an individual expressing rage and anger. As every warrior knows and as research confirms, anger and rage are more primitive forms of the Flight or Fight response because they suppress perceptual integration and cognitive processing, rendering fighters less effective and disabling their ability to negotiate effectively.

2.8 Offender Rehabilitation

Controlled research on incarcerated felons shows that TM practice reduces their hostility, anger, outbursts of violence and prison rule infractions (Abrams & Siegel, 1978; Bleick & Abrams, 1987; Gore, Abrams, & Ellis, 1984; Hawkins, Orme-Johnson, & Durchholz, 2005; Rainforth, Alexander, & Cavanaugh, 2003). For example, a 15-year study of convicted felons in Folsom maximum security prison showed that learning TM while in prison reduced the risk of recidivism (new prison terms) by 43.5% compared to matched controls co-varying for factors that are predictive of recidivism risk (Rainforth et al., 2003). Case histories of inmates imprisoned for chronic violent crimes indicate a transformation in their thinking and behavior, in which they are less likely to "fly off the handle" and more likely to remain calm and negotiate a peaceful conflict resolution (Ellis, 1983).

Indeed, TM has been found to be more effective than other prison rehabilitation programs for rehabilitating convicted felons (Alexander & Orme-Johnson, 2003; Alexander et al., 2003; Alexander, Walton, & Goodman, 2003; Bleick & Abrams, 1987; Rainforth et al., 2003), for review see (Hawkins et al., 2005). For example, a Harvard doctoral dissertation by Charles Alexander conducted on maximum security prisoners at Walpole prison, Massachusetts, found that TM practice truly rehabilitated the prisoners from within by creating unprecedented growth in psychological maturity. Compared to counseling and other prison programs, after 15.2 months of practice, new TM subjects moved from a conformist, dependent, exploitative orientation, to the self-aware modal stage of American adults on Loevinger's scales of ego development, characterized by a greater awareness of norms and goals. After three years of TM practice, those in the study further advanced to the self-aware state, which is considered to be more responsible, self-monitoring, self-respecting, and communicative. The TM group also decreased significantly in aggression, anxiety, and schizophrenic symptoms (Alexander & Orme-Johnson, 2003).

2.9 PTSD

Another major area of individual trauma that is globally impacting collective consciousness is PTSD. Controlled trials have found that transcending through the TM technique was significantly non-inferior to prolonged exposure therapy, the "Gold standard" of PTSD treatment, as well as more effective than psychotherapy, "adopted mantra meditation" (in which members use the same generic mantra during their instruction and daily practice in contrast to TM in which the mantras are individually prescribed according to the ancient Vedic meditation tradition) , patient-centered therapy, PTSD-health education, and treatment as usual. PTSD reduction through TM has been seen in studies on war veterans, war refugees, female and male prison inmates, and traumatized college students, indicating that its effects generalize across many populations who are impacted with different kinds of trauma (Bandy et al., 2019; Bellehsen, Stoycheva, Cohen, & Nidich, 2021; Brooks & Scarano, 1985; Herron & Rees, 2017; Kang et al., 2018; Nidich et al., 2018; S. Nidich et al., 2016; S. Nidich et al., 2017; Rees, Travis, Shapiro, & Chant, 2013, 2014; Rosenthal, Grosswald, Ross, & Rosenthal, 2011).

The conclusion from this wide array of research indicates that whatever the type of stresses the person has, whatever health imbalances, addictions, or trauma, the state of restful alertness produced by TM facilitates the natural feedback systems of the body to detect and repair these imbalances. In these many respects, the meditating citizen is becoming more *coherent*, and could be expected to contribute more coherence to all the levels of collective consciousness.

2.10 Developing Cognitive Abilities and Self-actualization

Clear thinking, self-actualization, and enlightenment are said to increase through the experience of transcending and are yet another way coherence can be operationalized in terms of the individual (Maharishi Mahesh Yogi, 1963, 1969). The series of studies that found transcending increases alpha1 EEG coherence also reinforce other evidence indicating that EEG coherence is correlated with creativity, intelligence, moral reasoning, and emotional stability (Dillbeck & Vesely, 1986; Nidich, Ryncarz, Abrams, Orme-Johnson, & Wallace, 1983; Orme-Johnson & Haynes, 1981; Orme-Johnson, Wallace, Dillbeck, Alexander, & Ball, 1989; Travis & Arenander, 2006). For a review, see (Cahn & Polich, 2006).

Controlled trials on the TM technique have found that it produces unprecedented longitudinal growth in cognitive measures, such as creativity, fluid intelligence, field independence, choice reaction time, and practical/emotional intelligence (Cranson et al., 1991; Dillbeck, 1982; Dillbeck, Raimondi, Assimakis, Rowe, & Orme-Johnson, 1986; So & Orme-Johnson, 2001). Meta-analyses and controlled trials have also found that transcending through TM is the most effective means of holistic personality development as indicated by measures of self-actualization and ego development (Alexander et al., 1990; Alexander, Rainforth, & Gelderloos, 1991; H. Chandler, Alexander, Heaton, & Grant, 2005). This is because transcending produces a direct experience of the *Self*, which is transcendental consciousness (Alexander et al., 1991).

2.11 Developing Enlightenment

Regular experience of transcending through TM practice alternated with daily activity habituates the nervous system to maintain transcendental consciousness throughout the 24-hour diurnal cycle, giving rise to cosmic consciousness, the first stable state of enlightenment in Maharishi's system of Seven States of Consciousness (Maharishi Mahesh Yogi, 1963, 1967/2011, 1969, 1977a). Maharishi (1969) explains:

> In order that transcendental bliss-consciousness may be lived at all times, it is necessary that it should not be lost when the mind comes out of meditation and engages in activity. For this to be possible, the mind has to become so intimately familiar with the state of Being that it remains grounded in the mind at all times through all mental activity of thinking, discriminating, and deciding, and through all phases of action on the sensory level. For this in turn, it is necessary that the process of gaining transcendental consciousness through meditation and that of engaging in activity should be alternated, so that transcendental consciousness and the waking state of consciousness may come close together and finally merge into one another to give rise to the state of cosmic consciousness, the state in which one lives bliss consciousness, the inner awareness of Being, through all the activity of waking and dreaming states and through the silence of the deep sleep state. (p. 184)

Frequency of experiences of cosmic consciousness are correlated with theta, alpha, and beta EEG coherence, but predominantly with alpha1 coherence (Orme-Johnson, Clements, Haynes, & Badawi, 1977). Dr. Lynne Mason and colleagues (1997) found that people experiencing Being during sleep (a phenomenon called *witnessing*) have a unique pattern of the EEG of transcendental consciousness (theta2/alpha1, 7-9 Hz) during classical deep sleep (delta EEG, 1-3 Hz), verifying that their subjective reports of experiencing the transcendent during sleep are physiologically based.

Whereas Mason studied people experiencing cosmic consciousness while they slept, Dr. Fred Travis and colleagues studied these subjects during dynamic activity. The subjects were people who reported experiencing cosmic consciousness during sleep, a hallmark that they were well established in that state of consciousness. But they were tested in this study while they were engaged in different reaction time tasks. The study found that compared to control groups of non-meditators and new meditators, the CC (cosmic consciousness) group had higher levels of brain integration on three distinct dimensions, which the authors combined into a brain integration scale (BIS) (Travis, Tecce, Arenander, & Wallace, 2002). Further research by Travis, Harald Harung and others found that the BIS predicts scores on standard creativity tests and distinguishes the most creative and successful people in different fields. Olympic athletes, top business executives, and police for whom the stresses of their jobs do not spoil their personal lives, scored higher on the BIS than their less successful cohorts (Charles, Travis, & Smith, 2011; Harung & Travis, 2019; Harung et al., 2011). Interestingly, both amateur as well as professional musicians scored high on the BIS, reinforcing other evidence indicating that the practice of music has a beneficial effect on brain development (Travis, Harung, & Lagrosen, 2011).

The groups in these studies did not practice the TM technique or other meditation techniques, indicating that the brain physiology of cosmic consciousness is a universal natural phenomenon correlated with success, not a TM or meditation-specific effect. Maharishi (April, 1972) states that human brain physiology has the inherent ability to naturally develop cosmic consciousness by adulthood, but that the stressful conditions of our times usually makes it necessary to have techniques of transcending, such as the TM technique, to unfold this genetic potential. Travis and Harung's findings that the most highly evolved people in society have higher levels of the brain physiology associated with cosmic consciousness, independently of their specific professions, indicates that cosmic consciousness, as defined in Maharishi's Seven States of Consciousness, is a completely natural developmental level. It is truly a "higher" state of human development because it is the hallmark of the most successful people in society (Alexander, Druker, & Langer, 1990).

Moreover, randomized controlled trials have shown that as little as 10 weeks of TM practice significantly increases the BIS in college students and school administrators and staff, indicating that TM practice causes the brain to rapidly develop in the direction of cosmic consciousness (Travis et al., 2018; Travis et al., 2009). This accords with Mason and Travis's earlier research, which found that short-term practitioners of the TM technique who have not yet experienced cosmic consciousness have significantly higher levels of the BIS than non-meditating controls, indicating that their brains are developing in that high level of integration even though they are not yet aware of it (Mason et al., 1997; Travis et al., 2002). As individuals grow in experiences of enlightenment, their contribution to collective consciousness can be expected to be more *coherent,* as seen in these many studies of physiological integration and psychological development described above.

3. The Maharishi Effect: Empirical Evidence that TM Practice by 1% of the Population Increases Coherence in Collective Consciousness

3.1 Definition of the Maharishi Effect

In the previous sections, we have been discussing development of coherence in the individual as the basic unit of collective consciousness. Now we will review research indicating that TM practice increases coherence on the level of society. Maharishi (1986b) explains that not all citizens need to transcend to reduce societal stress and improve the quality of life in society, because the effects of the coherent members of society are more powerful than the effects of the less coherent individuals. Maharishi (1978) further explains:

> Whenever one percent of the people in any community practice Transcendental Meditation, balance in nature increases, accidents become less, and all the collective values, which we call social values of society, become more positive. Individuals become incapable of thinking wrong things. Their thinking changes in favor of society. Crime rate falls, sickness becomes less, and all other negative aspects of life diminish. (p. 163)

Maharishi predicted that as little as 1% of the population practicing the TM technique would create a phase transition to increased orderliness in society. He is on record in an Innsbruck, Austria, newspaper, Tiroler Tageszeitung, 23 July 1962, as saying that "while ten percent would be ideal, even if only one percent of the world's population meditated it would be sufficient to do away with the hatred that causes war" (Katz, 2011, p. 60).

3.2 Discovery of the Maharishi Effect

The 1% effect was first observed in 1974 as a decrease in crime rate in four U.S. cities in the Midwest during the year that those cities exceeded 1% of their population learning the TM technique compared to control cities matched for population and geographic region. With this initial 1% finding, the researchers then expanded their study of crime rate changes to eleven 1% cities. Results indicated that there was a decrease in crime rate by 8.2% compared to an increase of 8.3% in eleven control cities, a highly statistically significant difference. Scientists named the phenomenon the Maharishi Effect in honor of Maharishi who had predicted it and who had provided the technology to make it possible (Borland & Landrith, 1977).

3.3 Phase Transition Model

This view that the few can affect the many is based on the principle of coherence in physics, which states that the influence of the coherent elements in a system is proportional to their number squared compared to the influence of incoherent elements, which is only proportional to their number. This was a phase transition model, in which the transition to a more ordered state only occurs after a critical threshold is exceeded. Common examples of phase transitions are the sudden transition of liquid water to ice when its temperature is reduced to 32 degrees F or below, or its transition to steam when its temperature is raised to 212 degrees F (Borland & Landrith, 1977; Dillbeck, Banus, Polanzi, & Landrith III, 1988; Dillbeck, Landrith, & Orme-Johnson, 1981; Hagelin, 1987; Orme-Johnson & Fergusson, 2018).

3.4 Replication of the Maharishi Effect

Soon after, the Maharishi Effect was replicated in a twelve-year study of 24 experimental and 24 control cities (Dillbeck et al., 1981) and then expanded to a seven-year study of 160 cities and 80 standard statistical metropolitan areas, which represented approximately half of the urban population of the U.S. (Dillbeck et al., 1988). These latter studies used annual data and controlled for numerous variables known to affect crime (median years education, percent unemployed, per capita income, percentage of families in poverty, stability of residence over five years, median age, percentage of people over 65, population size, population density, and ratio of police per population).

Cross-lagged panel causal analyses demonstrated that increases in the proportion of the population practicing TM predicted decreased crime that year and in following years. However, the opposite was not true. Changes in crime did not predict changes in TM participation. This pattern indicates causality. TM participation influenced crime rate but crime rate did not influence TM participation (Dillbeck et al., 1988). It was not as if crime rate rose and people ran down to the TM center to learn TM. It was that people learned TM, for whatever reasons, and the crime decreased.

3.5 The Maharishi Effect on the National Level

Recent studies have also demonstrated the Maharishi Effect on the national level in Norway, New Zealand, and Cambodia, measured as economic improvements relative to other nations and reduced poverty. These effects occurred only after 1% of the populations of the countries learned TM, supporting a phase transition model (Hatchard & Cavanaugh, 2017; Fergusson, 2016a).

4. The Extended Maharishi Effect: The √1% of the Population Practicing the TM and TM-Sidhi Program in a Group Increases Coherence in Collective Consciousness

4.1 Discovery of the Extended Maharishi Effect

In 1978, an even more powerful effect was introduced indicating that a phase transition to improvements in social indicators can be created by as little as the √1% of a population practicing TM plus the powerful advanced TM-Sidhi program *together in a group* (Dillbeck, Cavanaugh, Glenn, Orme-Johnson, & Mittlefehldt, 1987; Dillbeck, Foss, & Zimmermann, 1989). The predicted population size influenced by a given number of Transcendental Meditation and TM-Sidhi program participants has been tentatively modelled by the polynomial:

$$ME = aN_1 + bN_2^2 \quad (1)$$

where ME (Maharishi Effect) is defined as the size of the population that is positively influenced by the number of independent meditators distributed throughout the population (N_1) and the number of individuals practicing the more advanced TM-Sidhi program collectively in one place (N_2) (Orme-Johnson, Alexander, Davies, Chandler, & Larimore, 1988). The quadratic term reflects the proposed coherent influence resulting from constructive interference of the group of N_2 subjects. Coefficients a and b are empirically defined constants, with data suggesting that both have an estimated value of approximately 100 (for values of N over 100). The absence of a constant term follows from the assumption that the effect vanishes (and does not diverge) as N tends to zero. (Cubic and higher-order terms are neglected because they have no clear theoretical motivation) (Orme-Johnson et al., 1988).

The apparent necessity for having a single group meet at one time and place to produce this square root of 1% effect may be understood with reference to coherent physical systems such as lasers. In these systems, close proximity of elements is required to ensure that they have sufficient opportunity to stimulate coherent behavior in other members of the group. We assumed that the influence of the N_1 meditators in the population is negligible relative to the effects due to changes in the size of the group of advanced meditators, N_2^2. That is, the effect of people in the population meditating individually will be slower to change, almost constant, and much less powerful relative to the effect of advanced meditators meditating in a group whose membership changes day by day.

4.2 Key Studies on the Extended Maharishi Effect

This smaller √1% requirement made it possible to perform social experiments on cities, such as the national capitals of the U.S., India, and the Philippines (Dillbeck et al., 1987; Hagelin et al., 1999), on states (Dillbeck et al., 1987; Reeks, 1991, 2011), nations (Dillbeck, 1990; Fergusson, 2016a, 2016b; Fergusson & Cavanaugh, 2019; Hatchard & Cavanaugh, 2017; Orme-Johnson et al., 1988) and the world (Orme-Johnson, Dillbeck, & Alexander, 2003; Orme-Johnson, Dillbeck, Bousquet, & Alexander, 1979). This is the only experimental research in the social sciences on these scales, much less the only research to consistently show reduced stress and violence in society and improved quality of life (Orme-Johnson, Alexander, & Davies, 1990).

4.3 The MIU Group

Starting in mid-summer 2006, an effort was initiated by leaders of Maharishi International University (MIU) to expand the size of the TM-Sidhi program group from less than 400 in June 2006 to a number sufficient to predict a positive influence for the whole population of the U.S., the √1% of the U.S. population. According to the √1% formula, approximately 1725 group participants were required for the 297 million U.S. population at that time. Visitors from other parts of the U.S. and around the world were invited to participate in a special course held at MIU

in Fairfield, Iowa to join the group to try to reduce national stress and increase the quality of life in the U.S. (Morris, 2012).

To further augment the size of the group, starting in October of 2006, a special program was created for a group of several hundred visiting TM-Sidhi experts from India who were located on a campus near MIU. Funding was provided by the Howard and Alice Settle Foundation to bring this group to America and to provide a stipend to people to participate in the MIU group.

In 2016 and 2017, a series of four published papers reported the results of a nine-year prospective study of the effects of a group of TM and TM-Sidhi participants on stress reduction in the U.S. (Cavanaugh & Dillbeck, 2017a, 2017b; Dillbeck & Cavanaugh, 2016, 2017). A grant from the Howard and Alice Settle Foundation supported the formation and maintenance of a group exceeding N = 1725, which is the square root of one percent of the U.S. population, during the Demonstration period from 2007 to 2011. The study compared indicators of societal stress during this Demonstration period with the pre-demonstration Baseline period of 2000 to 2006, when the annual mean size of the group was N = 622, only approximately one third of the predicted group size needed to impact the population of the U.S.

Dillbeck and Cavanaugh's studies found that during the Demonstration period compared to the Baseline there were large statistically significant reductions in the rates of U.S. violent crimes, traffic fatalities, deaths by other types of accidents, drug related deaths, and infant mortality (Cavanaugh & Dillbeck, 2017a, 2017b; Dillbeck & Cavanaugh, 2016, 2017). A recent study on the same social experiment (Cavanaugh, Dillbeck, & Orme-Johnson, 2022) replicated the finding of significantly reduced trend of monthly homicide rates relative to Baseline during an expanded Demonstration period 2007-2011; this study also extended the prior findings of Dillbeck and Cavanaugh (2016) by reporting a significant increase in homicide trend, relative to the Demonstration period during a five-year Post Demonstration period 2012-2016 when the size of the TM-Sidhi group fell below the required √1% level. These studies replicated previous research on the Maharishi Effect on these variables (Orme-Johnson & Fergusson, 2018), and they took the research to a higher level. These were the most powerful demonstrations of the Extended Maharishi Effect yet because of the length and extent of the study, 12-15 years using official governmental statistics from the FBI and the Center for Disease Control. Moreover, these studies used state-of-the-art methods of time series regression analysis for eliminating potential alternative explanations due to intrinsic pre-existing trends and fluctuations in the data, and logically eliminated other factors known to influence the crime and national-stress variables.

4.4 The Present Study

The present study is a replication and extension of Dillbeck and Cavanaugh's work. It replicates their findings using annual data rather than monthly data. Annual data has the advantage of showing long-range trends more clearly, unmasked by the large fluctuations of seasonal cycles seen in monthly data.

The first study of what happened between 2012 and 2016 (when the size of the MIU group decreased back to baseline levels) used annual data and was reported at a conference of the Union of Scientists for Peace in Kiev, Ukraine in June 2017. It reported that the U.S. murder rate, which had decreased by 20.5% during the demonstration period of 2007-2011, turned around and increased by 18.3% during 2012 to 2016 as the size of the MIU group declined (Orme-Johnson, 2017).

The present study extends this study on murder rate to include eight variables in the same study (murder, rape, aggravated assault, robbery, infant mortality, traffic fatalities, drug induced deaths, and deaths by injuries in children and adolescents, ages 10-19 years) as well as a composite index of these. Dillbeck and Cavanaugh studied only two variables at a time. Including all the variables in one analysis has the advantage of displaying a common influence on all variables, as predicted by the theory that the effect is mediated by the unified field.

Most importantly, the present study, together with Cavanaugh, Dillbeck, and Orme-Johnson (2022), extends the previous research by investigating the effects of a marked decrease in the size of the coherence creating group by including a Post Demonstration period from 2012 to 2016 when the size of the group declined from √1% of the US population (1725 people) back to Pre-Baseline levels of around 600, which is only 1/3 of the predicted requirement needed to influence U.S. collective consciousness. The general hypothesis for the Post period is that as the size of the group decreased, the gain seen during the Demonstration period would decline. The predictions from the unified-field theory are that: 1) all stress indicators would simultaneously decrease when the group size reached the √1% threshold and 2) all stress indicators would simultaneously increase when the size of the group decreased to

below threshold. This reversal of the effect on all variables together would provide strong evidence of causality and support for the theory that the effect operates on the level of the unified field.

Previous research has shown that when the size of the coherence creating group decreased to below the √1% that the effect is reversed. However, these studies have been relatively short-term studies, for example, only two months long using daily data (Orme-Johnson et al., 1988) and weekly data (Hagelin et al., 1999). The present study, which is 17 years long using annual data, is too dissimilar from previous research to specify the exact time course of the predicted decay of the effect. That is a matter of empirical investigation, which the present study has done.

5. Methods

5.1 Hypothesis

The general hypotheses of this study are 1) that during the years when the size of a group practicing the TM and TM-Sidhi program together reached or exceeded a threshold of the √1% of the U.S. population (1725) the U.S. national stress would decrease, and 2) that when the size of the group decreased to below threshold, national stress would increase, reducing or reversing the positive benefits.

5.2 Independent Variable

The Demonstration period, Baseline and Post-Demonstration periods are defined with respect to the number of participants in the group practice of the Transcendental Meditation and TM-Sidhi program located in Fairfield, Iowa, at Maharishi International University (MIU). At MIU, students, faculty, staff, and community members gather to practice the Transcendental Meditation and TM-Sidhi program together before and after the school or workday. Daily totals of participants are recorded morning and evening from the meditation halls on campus, and the annual mean number of participants in the evening group program defined the "treatment" variable in this study.

5.3 Dependent Variables

All the dependent variables were annual statistics for the U.S. available from the FBI and U.S. Centers for Disease Control (CDC). Table 1 gives the sources and links to the data. The numbers and rates of violent crimes, as defined by the U.S. Federal Bureau of Investigation (FBI) Uniform Crime Reports, include murder and non-negligent manslaughter, forcible rape, aggravated assault, and robbery. Data from the CDC were obtained for remaining individual stress indicators: fatality rates due to infant mortality, drug-induced deaths, motor vehicle fatalities, and accidental deaths of children and adolescents ages 10-19.

Table 1. Sources and Links to Data

Dependent Variable	Data Sources and Links
Murder, Rape, Assaults, Robbery	FBI UCR Crime in the United States 1997-2016 https://ucr.fbi.gov/crime-in-the-u.s/2016/crime-in-the-u.s.-2016/topic-pages/tables/table-1
Infant Mortality	CDC Wonder Search, US Infant Deaths by Year 1999-2016: https://wonder.cdc.gov/controller/datarequest/D140;jsessionid=B78014716A5F9749431D497E667EDF28
Drug-Induced Fatalities	CDC Wonder Search, Multiple Causes of Death, 1999-2016 request UCD-Drug/Alcohol Induced. https://wonder.cdc.gov/controller/datarequest/D77;jsessionid=45FACD2233D3E75205E43E4E5DF536F3
Traffic Fatalities	CDC Wonder Search, Multiple Causes of Death, 1999-2016 request UCD-Injury Mechanism & All Other Leading Causes: Motor Vehicle Traffic https://wonder.cdc.gov/controller/datarequest/D77;jsessionid=45FACD2233D3E75205E43E4E5DF536F3
Deaths by Injuries, All Children and Adolescents Ages 10-19 Years	Curtin, S. C., Heron, M., Miniño, A. M. & Warner, M. (2018). Recent Increases in injury mortality among children and adolescents aged 10–19 years in the United States: 1999–2016. National Vital Statistics Reports 67, 1-16. Age-adjusted mortality rate per 100,000 person-years, directly standardized to the 2000 U.S. population https://www.cdc.gov/nchs/data/nvsr/nvsr67/nvsr67_04.pdf
U.S. Population	Populations are U.S. Census Bureau provisional estimates as of July 1 for each year except 2000 and 2010, which are decennial census counts.

5.4 Graphic Analysis

We first present a graphic analysis of visual inspection of the data, followed by two different methodologies that are appropriate for this data set, interrupted time series regression analysis and linear regression forecasting analysis. To visualize the results for all variables on the same scale, we standardized (z-transformed) all variables so that each variable was represented by a mean of zero and a standard deviation of 1.0. The composite U.S. Stress Index was the mean of the eight individual variables. The time series and regression analyses were conducted on this standardized data.

5.5 Interrupted Time Series Regression Analysis

The interrupted time series (ITS) regression analysis uses segmented-trend regression methodology with Box-Jenkins Autoregressive Moving Average (ARIMA) modeling of regression errors to model the trends in the dependent variables. The analysis assessed: Hypothesis 1, that trends in negative social indicators would decreased significantly during the Demonstration period (2007-2011) relative to the Baseline (2000-2006); and Hypothesis 2, that negative social indicators would increase again in the Post Demonstration period (2012-2016). Changes in trends during the Demonstration and Post-Demonstration periods were assessed using an ITS design (Cook & Campbell, 1979; Glass, 1997; Shadish, Cook, & Campbell, 2002).

When randomized controlled experiments are not feasible, ITS designs are appropriate for analysis of the longitudinal impact (or "treatment effect") of new programs, laws or policy changes, or other specific events in social (or other) systems. ITS analysis is also often termed "impact analysis" or "intervention analysis." ITS designs are characterized by potentially high internal validity for causal inferences in quasi-experiments (Cook & Campbell, 1979; Glass, 1997; Shadish et al., 2002). Such designs are called "interrupted time series" designs because it is anticipated that the implemented program can "interrupt," or alter, the trend and/or level of the time series outcome variable following program introduction. Even in the absence of a comparison group, ITS designs have potentially strong internal validity due to their control over "regression to the mean" (Linden, 2017) and because the time series behavior of the outcome during the baseline period prior to introduction of the program can be used to calculate an empirically based "counterfactual" for calculating treatment effects (Linden, 2017; Penfold & Zhang, 2013).

ITS designs have been used in many areas of the social and other sciences (McCleary, McDowall, & Bartos, 2017). For example, they have been extensively applied in the evaluation of approaches to reducing criminal violence (Dugan, 2010), and for assessing approaches for decreasing fatalities and injuries due to motor-vehicle and other accidents (Novoa, Pérez, Santamariña-Rubio, & Borrell, 2011).

We employed a segmented-trend ITS regression model similar to that discussed by Huitema and McKean (2000), Lewis-Beck (1986) and Linden (2015, 2017). The model allows for potentially autocorrelated regression errors generated by an autoregressive (AR) stochastic process. The segmented-trend model is given by the following regression equation:

$$y_t = \beta_0 + \beta_1 T_{1t} + \beta_2 T_{2t} + \beta_3 T_{3t} + \beta_4 T_{4t} + n_t \quad (2)$$

In equation 2, y_t is the dependent variable (the composite U.S. Stress Index or individual social indicators) and T_{1t} is an annual time counter giving the linear time trend for the Baseline period 2000-2006, where T_{1t} = 1, 2, 3, …, 17. The linear trend during the Demonstration period (2007-2011) T_{2t} is zero prior to 2007 and subsequently is given by T_{2t} = 1, 2, 3, …, 10. Similarly, the linear trend segment T_{3t} for 2012-2014 is zero prior to 2012, and then T_{3t} = 1, 2, 3, 4, 5. Likewise, the linear trend T_{4t} for 2015-2016 is zero prior to 2015 and thereafter T_{4t} = 1, 2. In view of the small sample size (N = 17), the trend segments in equation 2 are assumed to be joined at their ends in order to conserve degrees of freedom. The details of how the time trends for these trend segments are formulated are described in Marsh and Cormier (2002, pp. 11-12) and Mitchell (2012, p. 88).

The regression coefficient β_0 is the intercept, or starting level, of the outcome variable y_t. β_1 is the slope of the Baseline time trend T_{1t}, which gives the annual rate of change for y_t during 2000-2006. The regression coefficient β_2 for T_{2t} during the Demonstration period 2007-2011 gives the change in slope of the y_t trend from its baseline value (β_1) to its value during 2007-2011 ($\beta_1 + \beta_2$). For the Post period, the general hypothesis was the trend would increase as the MIU group size decreased. But since the size decreased slowly at first and then rapidly later, we modeled it in two segments, with the hypothesis that the more rapid reduction in size of the group would create a trend shift relative to the slower decline in numbers. Thus, the first Post segment β_3 gives the change in trend from the Demonstration period to the following trend segment during 2012-2014, which has slope ($\beta_1 + \beta_2 + \beta_3$). Likewise, the second Post segment β_4 gives the change in trend from the 2012-2014 trend to that during 2015-2016 ($\beta_1 + \beta_2 + \beta_3 +$

β_4). Note that the slope for each linear trend segment after the Baseline period is given by the slope during the previous segment plus the trend change from the present segment.

The regression error term n_t may take the form of a stationary and invertible autoregressive (AR) stochastic noise process with zero mean (Box, Jenkins, Reinsel, & Ljung, 2016; Pankratz, 1991): $n_t = \phi(B)\ \varepsilon_t$. In this expression for the noise model, ε_t is an independent and identically distributed, serially uncorrelated normal "white noise" process with mean zero and variance σ^2; $\phi(B)$ is the autoregressive operator $\phi(B) = 1 - \phi_1 B^1 - \phi_2 B^2 - \ldots - \phi_p B^p$; and B is the backshift operator $Bx_t = x_{t-1}$.

Estimation of equation 2 employed Autoregressive (AR) modeling of any significant autocorrelation in the regression errors (Box, Jenkins, Reinsel, & Ljung, 2016; Liu, 2009; Pankratz, 1991). The form of the AR noise model n_t in equation 2 was identified using a systematic search of autocorrelations and partial autocorrelations in the data based on an objective criterion, the Akaike information criterion (AIC) (Akaike, 1974). The modified version of the AIC used here, the AICc, is appropriate for use with both small and large samples (Brockwell & Davis, 2016).

Using ordinary least squares (OLS) residuals from the estimates of equation 2 for each of the nine dependent variables, a search was conducted for alternative AR noise models with maximum AR lag 5; then the fitted models were ranked by AICc values. The stationary and invertible AR model that minimized the AICc was selected for inclusion in the regression model.

The resulting AR noise model was then jointly estimated with the other regression coefficients in equation 2 using maximum likelihood (ML). The ML estimation employed a state space algorithm in Stata 15 software (StataCorp, 2017, pp. 98-103) that provides standard errors (SEs) robust to heteroskedasticity and symmetric non-normality of the regression residuals. The parameters of these analyses are shown in Tables 2-4 in the Results section.

5.6 Linear Regression Forecasting Analysis

Linear regression forecasting analyses fit a linear regression to the dependent variables during the Baseline period *expressed as number of events* (crimes, etc.), and then forecast from the regressions what the number of events would have been during the Demonstration and Post periods, *had the baseline trends continued*.

The method was to fit a linear regression model to each of the eight individual variables for the Baseline period 2000 to 2006, and then use the model to forecast from the Baseline into the Demonstration (2007-2011) and Post (2012-2016) periods what the level of the events would have been if the Baseline trend had continued. The forecast for each dependent variable was calculated by linear regression as follows:

$$Y = a + b * T \tag{3}$$

where Y is the forecast number of events, "a" is the y-intercept, "b" is the slope (annual rate of change of Y), and T is time represented by integers from 1 to 7, representing the years 2000 to 2006 of the Baseline period.

We used the Excel functions for *intercept* and *slope* to calculate the values of "a" and "b" for each of the eight dependent variables and the composite U.S. Stress Index. Using these linear equations, we then calculated the values of each dependent variable over the entire 17-year period of the experiment, in which T varied from 1 to 17, spanning the Baseline, Demonstration, and Post periods. This provided a linear forecast of what the levels of crimes etc. would have been during the Demonstration period of 2007 to 2011 and during the Post period of 2012 to 2016 *if the Baseline trend had continued* during those years. In cases where the slope was zero (no linear regression) during the baseline, we used the mean of the Baseline period as the forecast value for the Demonstration and Post periods.

For a treatment effect, we then calculated the difference between the actual number of events from the forecast number of events (actual minus forecast) during each period, Baseline, Demonstration, and Post periods. The expectation was that there would be very little difference between forecast and actual values of each variable during the Baseline period because the regressions were fitted to those data. Hypothesis 1 was supported if the total sum of actual yearly events during the Demonstration period fell significantly below the values forecast from the Baseline. For the Post period, when the size of the coherence creating group declined again, Hypothesis 2 was supported if the difference between forecast and actual values declined, as predicted from a loss of coherence in the country.

6. Results

6.1 Graphical Analysis of the Time Series Variables

We first present graphical analysis of the results, then the statistical analyses. With graphical analysis, it is possible to compare different parameters and their dynamical relationships in an easily understandable way (Unwin, 2015).

6.1.1 Independent Variable. Figure 1 shows the independent variable, which is the time series data for the mean annual size of the TM and TM-Sidhi group in Iowa, plotted as a function of years, which defines the Baseline, Demonstration, and Post periods used in the study. The horizontal dotted green line indicates the threshold of the √1% of the U.S. population, the predicted minimum group size needed to influence the U.S. as a whole. During the Baseline period, 2000 through 2006, the mean number of participants in the group was 622, only 36% of the required threshold. The vertical dotted lines indicate the Demonstration period, when the √1% (N=1725) was reached in 2007 and maintained through 2011. The mean group size during the Demonstration period, was 1815, which is 105% of the √1% threshold.

During the Post period (2012-2016), the size of the group declined most steeply between 2013 to 2016. By 2016 the mean group size was 628, again only 36% of the required √1% threshold, the level it was during the Baseline.

Hypothesis 1 was that U.S. national stress would decrease during the Demonstration period relative to the Baseline period, as indicated by reductions in trends for the objective stress indicators. Hypothesis 2 was that when the size of the coherence creating group decreased again back to baseline levels, U.S. national stress would increase again, as indicated by increased crime and other negative trends.

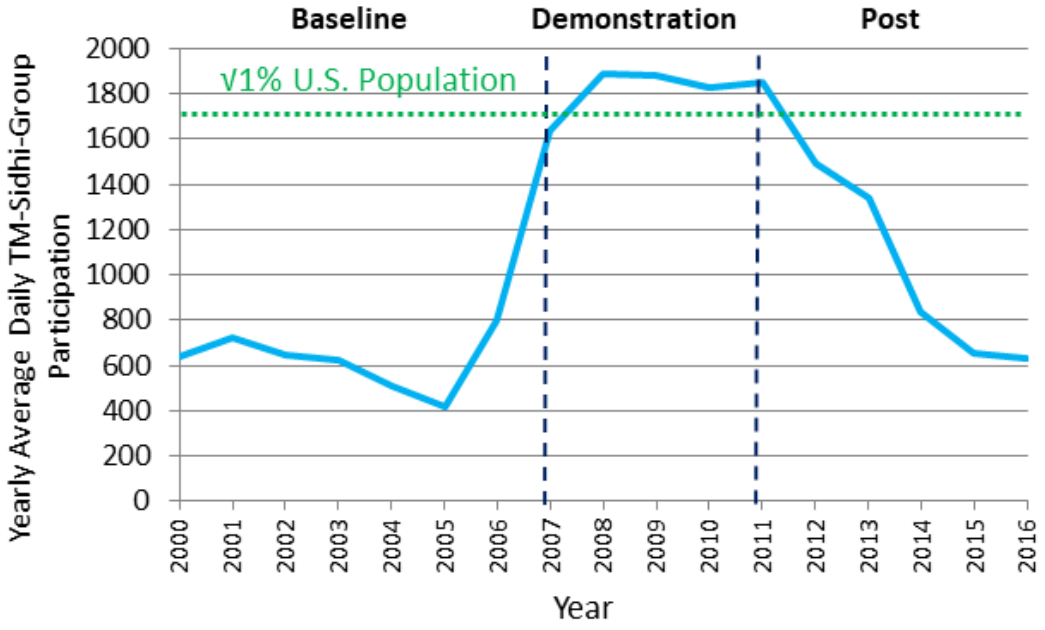

Figure 1. Independent Variable: The mean number of participants per day in the TM and TM-Sidhi group at Maharishi International University per year from 2000-2016, defining the Baseline, Demonstration, and Post periods

6.1.2 Dependent Variables. Figure 2 shows the independent variable (blue), the composite U.S. Stress Index (red), and the various individual dependent variables (in different colors) from 2000 to 2016. This graphic analysis shows that at the onset of the Demonstration period the slopes of all dependent variables decreased sharply relative to their slopes during the Baseline, indicating simultaneous decreases in all the measured negative trends in the U.S. For drug-related deaths, which were increasing rapidly during the Baseline period, the reduction in slope was expressed as leveling off during the Demonstration period in contrast to its prior rising trend. The mean decrease in trend across all variables during the five-year Demonstration period, as indicated by the U.S. Stress Index, was approximately 2 standard deviations—a large effect size.

In the Post period, when the size of the TM and TM-Sidhi group began to decline, the downward slopes of the dependent variables became less steep from 2011 to 2013. Then from 2014-2016, as the size of the group dropped precipitously, all negative social indicators increased sharply, by an average of one standard deviation.

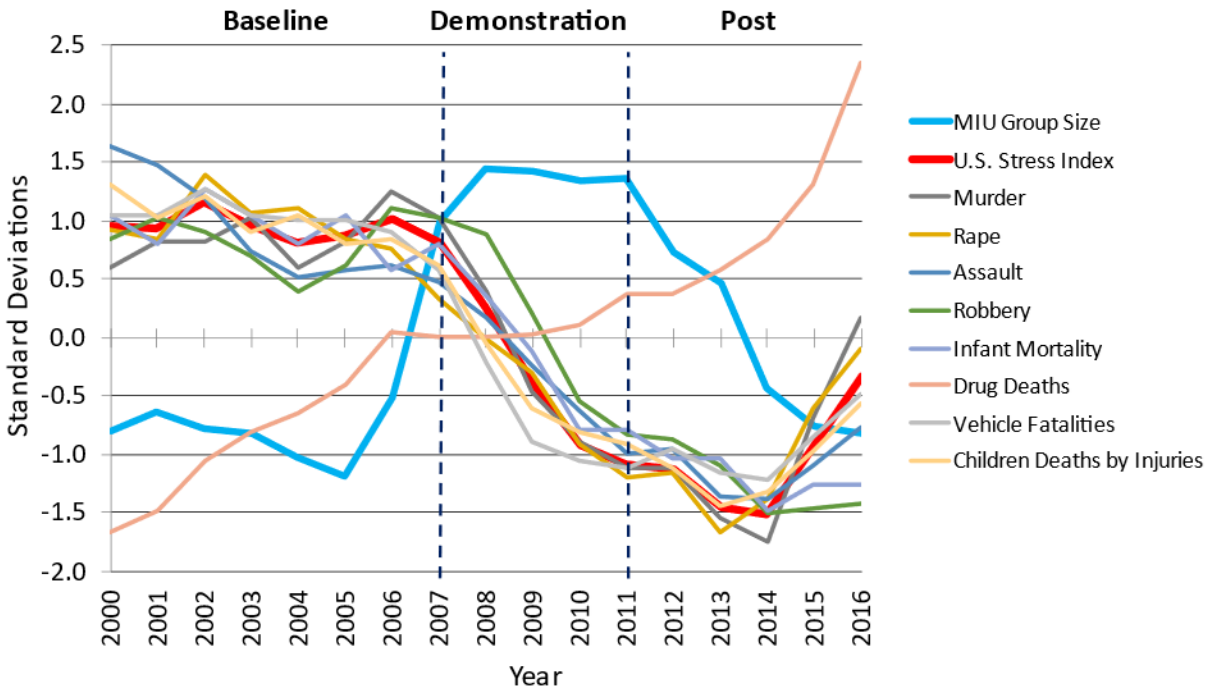

Figure 2. Time series of independent and dependent variables: Normalized (Z-transformed) data for the size of the Group of TM and TM-Sidhi Participants (MIU Group Size) in blue, the mean of the various stress indicators in red (U.S. Stress Index), and the various individual stress indicators in different colors as identified in the legend. The figure shows a phase transition to a global reduction of negativity in the U.S. when the critical threshold of the √1% of the U.S. population was practicing the TM and TM-Sidhi program together in a group.

These data support the prediction of a global phase transition in reduction of U.S. national stress only after the holistic organizing power of the unified field was enlivened by the √1% of the U.S. population practicing the TM and TM-Sidhi program. Figure 3 shows that although the size of the coherence creating group began to rise in 2005, no effect was seen until 2007 when the critical √1% threshold of group size was reached. At that point, the slopes of all social indicators began to decrease. At the phase transition point, there was an immediate and abrupt downturn in a diverse array of problems in the U.S., as predicted by theory and previous research (Orme-Johnson & Fergusson, 2018).

In the Post period, a leading-lagging relationship is also seen when the size of the MIU group dropped steeply starting in 2013, followed by rapid deterioration in the U.S. Stress Index and individual variables the following year, 2014.

6.2 Interrupted Time Series Analysis

The hypothesized trend shift during the Demonstration period implies a cumulative decrease in the predicted value of the dependent variable during the Demonstration period relative to its "counterfactual" value that would have been observed if the baseline trend had continued through 2002-2011. This cumulative impact is termed the treatment effect (TE) of the quasi-experiment for the stress indicators. The TE is the change in trend slope multiplied by five, the number of years of the Demonstration period, or $5(\beta_2)$. The TE will have the same sign and statistical significance as the change in trend slope (β_2). The TE is a standard measure of the impact of treatment in ITS quasi-experimental designs (Linden, 2017; Penfold & Zhang, 2013). Graphically, the TE is the vertical distance between (1) the predicted (counterfactual) value of the 2011 stress indicators that would be observed if the baseline trend had continued during the Demonstration period and (2) the regression predicted (or "fitted") value of the index in the final year of the Demonstration period (2011).

Table 2 shows the results of the interrupted time series (ITS) analysis for Hypothesis 1, that negative social indicators will decrease during the Demonstration period (2007-2011) compared to the prior Baseline period (2000-2006).

Column 1 of Table 2 shows the dependent variables and column 2 shows the maximum likelihood estimate treatment effects (TE Estimate) for each variable. The *t*-ratios are shown in column 3 and the 95% confidence intervals in column 4, with *p*-values shown in the footnotes a through d. The ES measure *f* is the square root of Cohen's f^2 for a regression coefficient (Cohen, 1988), where 0.59, 0.39, and 0.14 are considered large, medium, and small effects, respectively. The latter benchmarks are the square root of those given by Cohen (p. 413) for f^2 (0.35, 0.15, and 0.02, respectively). The ES may be written as the *t*-ratio for the regression coefficient divided by the square root of the degrees of freedom for the regression residuals (Darlington & Hayes, 2017, pp. 226-228; Grissom & Kim, 2012, p. 322). These results indicate that the observed changes in all dependent variables during the Demonstration period were practically (or substantively) significant as well as statistically significantly in the predicted direction.

Table 2. Tests of Treatment Effects for Hypothesis 1: Decreased Cumulative Demonstration-Period Trends (2007-2011) Relative to Baseline Trend (2000-2006)

Variable	TE Estimate[1]	*t*-ratio[2]	95% CI[3]
U.S. Stress Index	–2.204	–18.57[a]	[–2.437, –1.972]
Murder	–2.676	–19.83[a]	[–2.940, –2.411]
Rape	–1.915	–9.25[a]	[–2.321, –1.509]
Robbery	–1.895	–5.46[a]	[–2.576, –1.125]
Assault	–.528	–3.41[c]	[–.832, –.224]
Motor-Vehicle Fatalities	–1.980	–10.46[a]	[–2.351, –1.609]
Infant Mortality	–1.645	–4.79[b]	[–2.318, –.972]
Child Accidental Deaths	–1.554	–7.97[a]	[–1.936, –1.172]
Drug-Related Fatalities	–1.019	–17.74[a]	[–1.131, –.906]

Note: Data sources: FBI Uniform Crime Reports, U.S. Centers for Disease Control. Sample is 2000-2016, $N = 17$. 1. Maximum likelihood estimate of treatment effect. 2. Asymptotic *t*-ratio with 12 *df* for rape, infant mortality, and child accidental fatalities, and 10 *df* for the remaining variables. 3. The 95% confidence interval for TE (two-sided). One-tailed *p* values: a. $p < .0001$ b. $p < .001$ c. $p < .01$

Table 3. Tests for Hypothesis 2: Increased Trends During the Post Demonstration Periods Relative to Baseline Trend (2000–2006)

	2012 Change in Trend			2015-2016 Trend vs. 2007-2011Trend		
Variable	Trend Shift 2012[1]	*t*-ratio[2]	95% CI[3]	Trend Shift 2015[4]	*t*-ratio[2]	95% CI[3]
U.S. Stress Index	.320	9.20[a]	[.252, .388]	.986	21.10[a]	[.895, 1.078]
Murder	.271	8.00[a]	[.205, .338]	1.385	25.16[a]	[1.277, 1.493]
Rape	.352	7.14[a]	[.255, .449]	1.132	13.21[a]	[.964, 1.300]
Robbery	–.109	–1.65	[–.238, .021]	.540	10.88[a]	[.443, .638]
Assault	–.027	–0.39	[–.161, .108]	.657	7.77[a]	[.492, .823]
Motor-Vehicle Fatalities	.638	14.61[a]	[.553, .724]	.563	6.14[a]	[.384, .743]
Infant Mortality	.183	2.15[d]	[.016, .350]	.413	6.26[a]	[.284, .542]
Child Accidental Deaths	.297	4.20[b]	[.159, .436]	.787	17.25[a]	[.697, .876]
Drug-Related Fatalities	.116	4.18[b]	[.062, .170]	.678	18.36[a]	[.606, .751]

Note: Data sources: FBI Uniform Crime Reports, U.S. Centers for Disease Control. Sample is 2000-2016, $N = 17$. 1. Maximum likelihood (ML) estimate of trend shift in 2012 (β_3). 2. Asymptotic *t*-ratio with 12 *df* for rape, infant mortality, and child accidental fatalities, and 10 *df* for the remaining variables. 3. 95% confidence interval (two tailed). 4. ML estimate of ($\beta_3 + \beta_4$) which is 2015-2016 trend slope relative to Demonstration period slope. One-tailed *p* values: a. $p < .0001$ b. $p < .001$ c. $p < .01$ d. $p < .05$

Table 3 shows that when the MIU group size decreased, all social indicators of negative trends in society increased. The precise nature and timing of dynamic effects in interrupted time series research are virtually always empirically determined (e.g., see Box & Tiao, 1975; McLeary et al., 2017). The left side of Table 3, labeled "2012 Change in Trend", shows the trend change for the first Post period, from 2012 to 2014. All variables increased, with statistical significance levels of $p < .0001$ for the overall U.S. Stress Index, murder, rape, and motor vehicle fatalities; $p < .001$ for child and adolescent accidental deaths and drug related fatalities; and $p < .05$ for infant mortality. Robberies and assaults did not reach statistical significance, but they moved in the predicted direction.

The right side of Table 3, labeled "2015-2016 Trend vs. 2007-2011", shows the trend shifts for the period when the size of the group rapidly decreased (2015-2016), compared to the trend during the Demonstration period, 2007-2011. All p's < .0001 are highly statistically significant. For this comparison, the ML coefficients ranged between 1.385 for murder to .540 for robberies, considered to be large to moderate TEs. These values quantify what can be seen by visual inspection in Figure 2.

Table 4. U.S. Stress Index and Index Components: Maximum Likelihood Regression Estimates with Correction for Autoregressive Errors

Parameter Estimates[1]

Variable	Baseline Trend 2000–2006 (β_1)	Trend Shift 2007 (β_2)	Trend Shift 2012 (β_3)	Trend Shift 2015 (β_4)	Constant Term (β_0)	AR Noise Model
U.S. Stress Index	.010 (0.75)	–.441 (–18.57)[a]	.320 (9.20)[a]	.667 (9.05)[a]	.935 (13.98)[a]	Lag 2: –.501 (–3.69)[c]
						Lag 3: –.417 (–2.44)[d]
Murder	.086 (4.66)[c]	–.535 (–19.83)[a]	.271 (8.00)[a]	1.114 (14.09)[a]	.505 (4.64)[c]	Lag 2: –.471 (–4.43)[b]
						Lag 3: –.476 (–4.47)[b]
Rape	–.038 (–1.33)	–.383 (–9.25)[a]	.352 (7.14)[a]	.780 (6.84)[a]	1.133 (6.48)[a]	None (white noise)
Robbery	.074 (1.91)	–.379 (–5.46)[a]	–.109 (–1.65)	.649 (8.33)[a]	.522 (3.10)[c]	Lag 1: .974 (7.43)[a]
						Lag 2: –.862 (–12.95)[a]
Assault	–.147 (–10.40)[a]	–.106 (–3.41)[c]	–.027 (–.39)	.684 (5.13)[a]	1.548 (21.76)[a]	Lag 1: .270 (2.01)
						Lag 3: –.769 (–8.39)[a]
Motor Vehicle Fatalities	–.063 (–2.63)[d]	–.396 (–10.46)[a]	.638 (14.61)[a]	–.075 (–.62)	1.303 (11.82)[a]	Lag 1: .480 (3.93)[c]
						Lag 2: –.785 (–5.35)[b]
Infant Mortality	–.023 (–.65)	–.329 (–4.79)[b]	.183 (2.15)[d]	.230 (2.06)[d]	1.067 (7.32)[a]	None (white noise)
Child Accidental Deaths	–.073 (–3.96)[c]	–.311 (–7.97)[a]	.297 (4.20)[b]	.489 (5.74)[a]	1.310 (15.24)[a]	None (white noise)
Drug-Related Fatalities	.264 (47.13)[a]	–.204 (–17.74)[a]	.116 (4.18)[b]	.562 (10.13)[a]	–1.922 (–74.39)[a]	Lag 1: –.567 (–2.44)[d]
						Lag 2: –.494 (–2.50)[d]

Note: Sample is 2000-2016, $N = 17$. 1. Maximum likelihood estimates with asymptotic t-ratios that are robust to heteroscedasticity and symmetric nonnormality. t-statistics have 12 df for rape, infant mortality, and child accidental fatalities, and 10 df for the other variables. Two-tailed p values except one-tailed for β_2, β_3 and β_4: a. $p < .0001$ b. $p < .001$ c. $p < .01$ d. $p < .05$

Table 5. Diagnostic Statistics for the Regression Models Shown in Table 4

Variable	SD Residuals[1]	Q Test of Serial Correlation (Lags 1-6)[2]	Normality Test[3]	Stationarity Test[4]
U.S. Stress Index	.075	3.431	.020	.885
Murder	.107	4.426	–.654	.902
Rape	.159	3.561	–1.09	NA
Robbery	.108	3.654	.664	.929
Assault	.082	1.409	–.861	.960
Motor Vehicle Fatalities	.110	6.918	–.294	.886
Infant Mortality	.169	6.683	–.185	NA
Child Accidental Deaths	.121	7.811	–.964	NA
Drug-Related Fatalities	.072	5.293	2.48[c]	0.703

Note: 1. Standard deviation of regression residuals. 2. Ljung-Box Q test for autocorrelation of model residuals at lags 1-6 (Chi-square test with $df = 6 - m$, where m is number of estimated AR noise parameters). None of these Chi-squares were statistically significant, indicating that there were no significant auto correlations in the residuals for lags 1-6. 3. Shapiro-Wilk test for normality of model residuals (standard normal test statistic). This test indicates that the distribution of the sample is not significantly different from a normal distribution for any variable, except for Drug-Related Fatalities, c. $p < .01$. 4. Modulus for maximum inverse root of AR polynomial. Values < 1.0 imply roots of the characteristic equation are outside the unit circle. All variables were inside the unit circle, indicating stationarity of the AR noise models.

The continued improvement (decline) in the negative social indicators and U.S. Stress Index during 2012-2014 followed by an sharp rise in 2015-2016 is consistent with previous research (Hagelin et al., 1999) suggesting that the beneficial impact of a large TM-Sidhi group may be expected to decay relatively slowly after the group declines in size below the √1% threshold, especially if the group had been exceeding the √1% level for an extended time. Also, the observed pattern of continued but slower improvement in social indicators after the group size fell below the critical threshold followed by a subsequent lagged reversal of positive trends is consistent with theoretical considerations. After the group size fell below the √1% threshold, Maharishi's theory of collective consciousness predicts that the level of stress in collective consciousness that had been reduced during the Demonstration period may be expected to begin building up again, gradually eroding the gains of the Demonstration period. When coherence in collective consciousness declines sufficiently, the improved trends in social indicators will begin to be reversed. This theoretical prediction is consistent with the pattern we observed empirically in the current study.

Table 4 shows the details of the autoregressive noise models and Table 5 shows the diagnostic tests used in the ITS analysis. Table 4 displays the full regression results for each variable including the form of the AR noise model for each regression, as identified using the objective AIC criterion. For each trend shift, the parameter estimate is presented and beneath it in parenthesis is the *t*-statistic for the significance of the trend shift from the 2000-2006 Baseline. In the case of the Ordinary Least Squares (OLS)-based analyses as well as the regressions with ARMA errors, all diagnostic tests are satisfactory, supporting statistical conclusion validity.

In sum, the findings reported in Tables 2 and 3 lend strong empirical support for both research hypotheses of the current study. During the 2007-2011 Demonstration period the trend for the overall composite U.S. Stress Index and its eight component social indicators changed in the predicted direction of reduced trend relative to the Baseline trend. These changes occurred at the predicted time, beginning in 2007 with the onset of the Demonstration period. The large treatment effects for the analyses reported in Tables 2 and 3 indicate that the findings are practical as well as statistically significant. These results were reported in terms of standard deviations. To assess the human impact, we also studied the magnitude of change in the social indicators in term of number of events using linear regression analysis.

6.3 Linear Regression Analysis

6.3.1 Drug-Induced Deaths

Figure 3 shows the linear regression on drug-induced deaths over the seven-year Baseline period from 2000 to 2006 (red dotted line) projected into the Demonstration and Post periods, to estimate the level of events if the Baseline

trend had continued. The intercept was 16 328 deaths per year, and the slope was 3037.12 as shown in the equation at the bottom of the chart.

For comparison with the forecast value (red dotted line), the actual number of deaths each year is indicated by the black line. During the Demonstration and Post periods, the actual number of events were substantially lower than the forecast values, −33 136 and −46 805, respectively. This is an estimated total of 79 940 fewer drug-induced deaths during the Demonstration and Post periods combined than is predicted by the Baseline trend, a 15% reduction (shown in red type on the chart). It can also be seen in Figure 3 that by the end of the Post period, the number of drug-related deaths per year had returned to the predicted Baseline level.

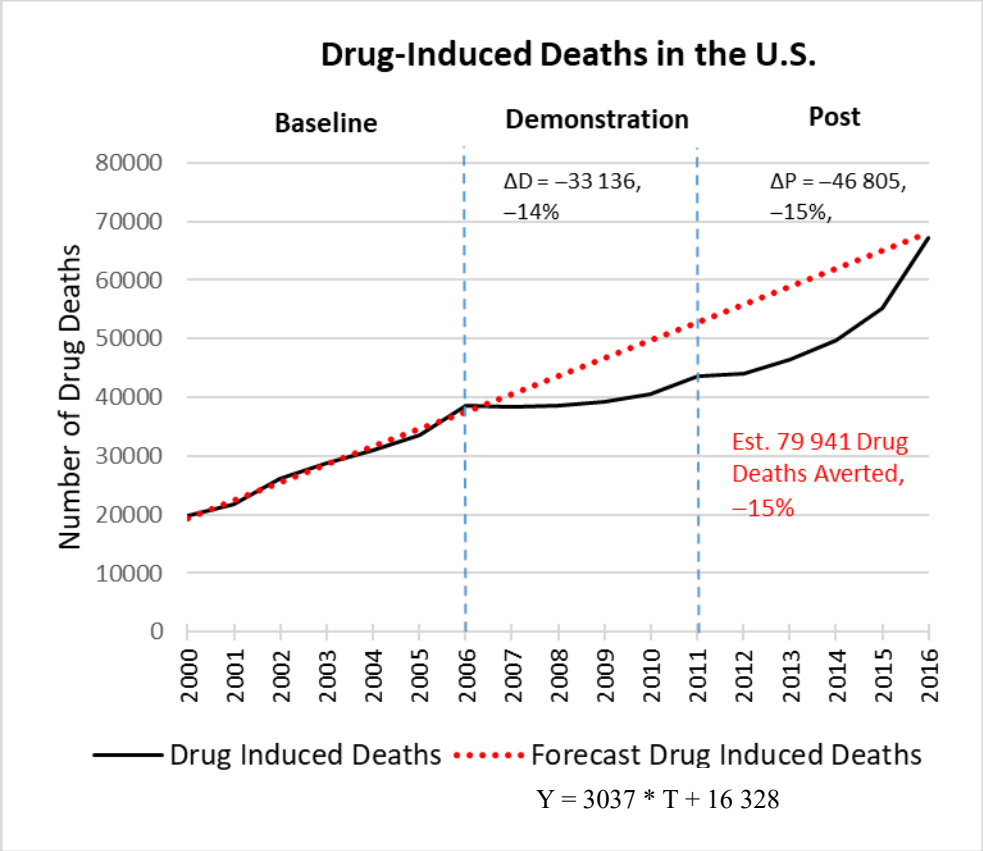

Figure 3. Linear regression of number of drug-induced deaths over time during the Baseline period (red dotted line) forecast into the Demonstration and Post periods. The number of drug-induced deaths (black line) decreased below the forecast levels during the Demonstration and Post periods.

6.3.2 Aggravated Assaults

There was no significant linear regression for aggravated assaults during the Baseline; the slope was 0 (see Figure 4). Therefore, the mean of the Baseline period (879 281 assaults per year) was used as the forecast value for the Demonstration and Post periods (red dotted line). It can be seen in Figure 4 that the assaults progressively decreased throughout the Demonstration period relative to the Baseline, and then turned around and began to increase again in 2013 in the Post period, which corresponded to a rapid decrease in the size of the coherence creating group.

The sum of deviations during the Demonstration period from the Baseline mean was 339 583 fewer aggravated assaults, with another 609 049 fewer during the Post period, for a total of 949 049 fewer assaults than predicted from the Baseline period, an 11% overall reduction. When the size of the coherence group declined rapidly starting from 2014, the numbers of assaults rapidly began to increase.

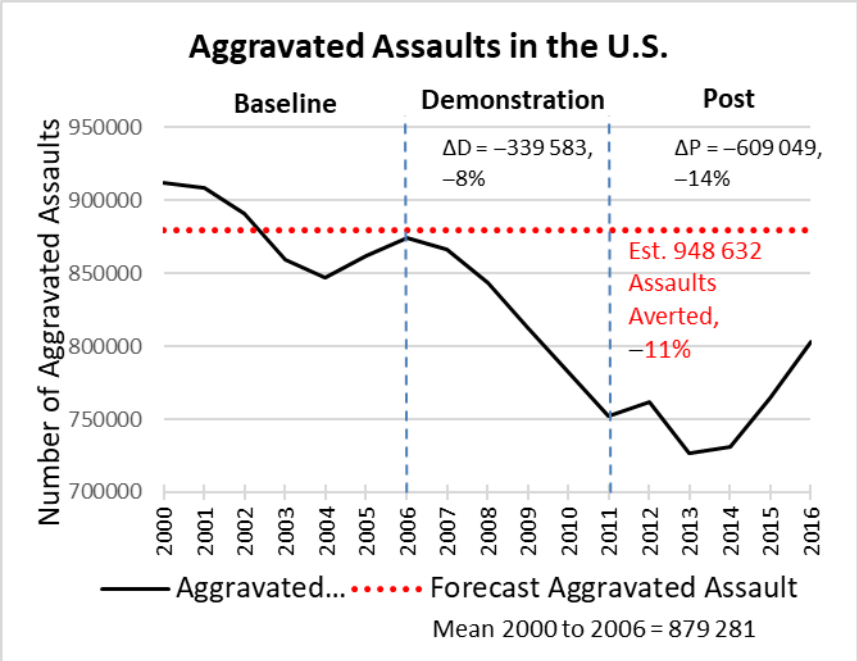

Figure 4. There was no significant linear regression for number of aggravated assaults in the U.S. over time during the Baseline period, so the forecast level was the mean of the Baseline (red dotted line). The actual number of aggravated assaults decreased below the forecast levels during the Demonstration and Post periods by almost a million fewer assaults (949 049). The reduced trend in assaults increased from 2014 when the size of the coherence group declined rapidly.

6.3.3 Robberies

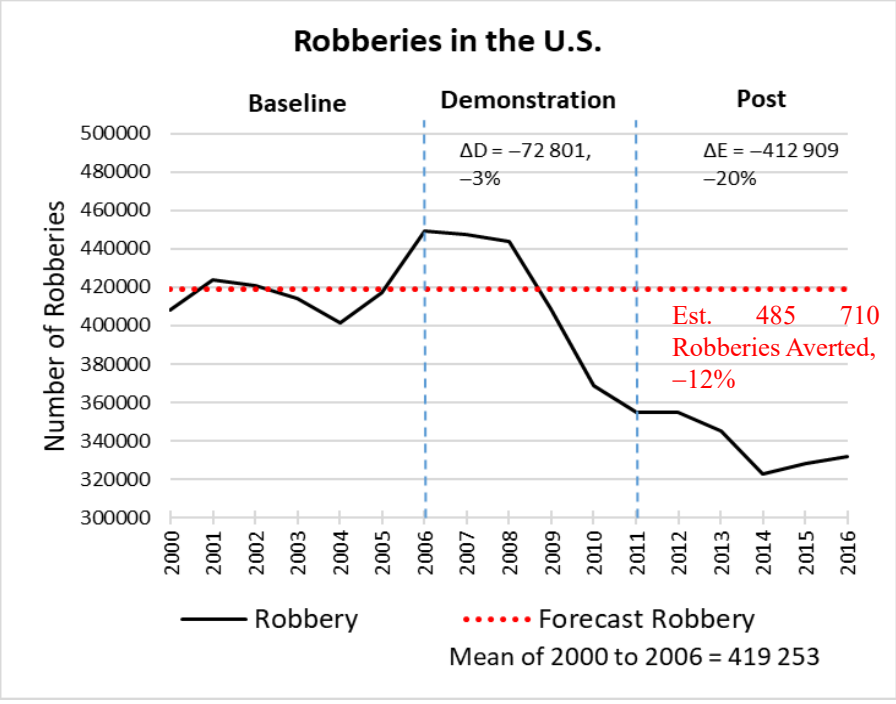

Figure 5. The regression for robberies during Baseline was not significant and the Baseline mean was the forecast value for subsequent years (red dotted line, 419 253). Robberies during the Demonstration and Post periods combined were 484 710 fewer than the Baseline mean, −12%.

Figure 5 shows the results for robberies. The linear regression on robberies during the Baseline was not significant, the slope = 0. Thus, the mean of the Baseline was the forecast value. The robberies were 72 801 less than forecast during the Demonstration period and another 412 909 less during the Post period, for a total of 484 710 fewer robberies than predicted from Baseline levels, −12%. When the size of the coherence creating group decreased steeply, in 2014, robberies began to increase.

6.3.4 Rape

Figure 6 shows that rapes also were not changing linearly during the Baseline period, with a mean of 93 438 rapes per year in the U.S., which was the forecast value for the following years. Regression analysis forecast 53 356 fewer rapes during the Demonstration and Post periods than predicted from the mean of the Baseline, a reduction in suffering for thousands of victims and their families and friends. Starting in 2013, and particularly in 2014 when the size of the coherence creating group decreased rapidly, rapes increased precipitously.

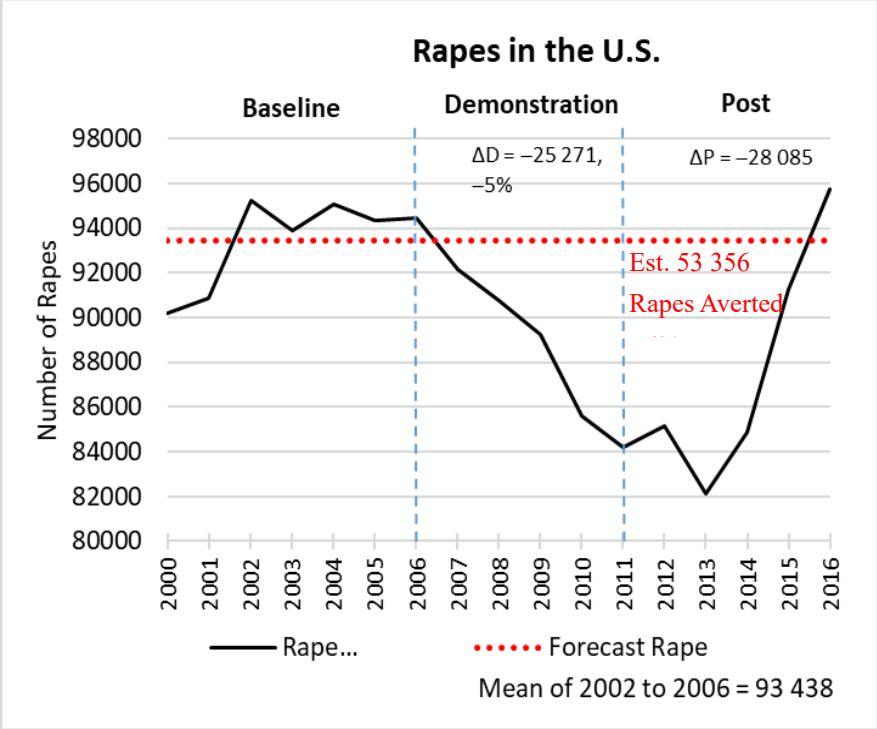

Figure 6. The linear regression of rape was not significant during the Baseline. Consequently, the mean of the Baseline of 93 438 rapes per year was used to forecast the expected level during the Demonstration and Post periods. There were 53 356 fewer rapes during the Demonstration and Post periods than expected from the mean number during the Baseline. Rapes increased rapidly when the size of the coherence creating group declined rapidly in 2014.

6.3.5 Child and Adolescent Deaths by Injuries

Figure 7 shows a similar pattern for child and adolescent deaths by injuries, an average of 86 348 deaths during the Baseline period, with an immediate drop throughout the Demonstration period and continuing for a couple of more years into the Post period, and then reversing sharply when the size of the TM and TM-Sidhi group decreased precipitously between 2013 and 2014.

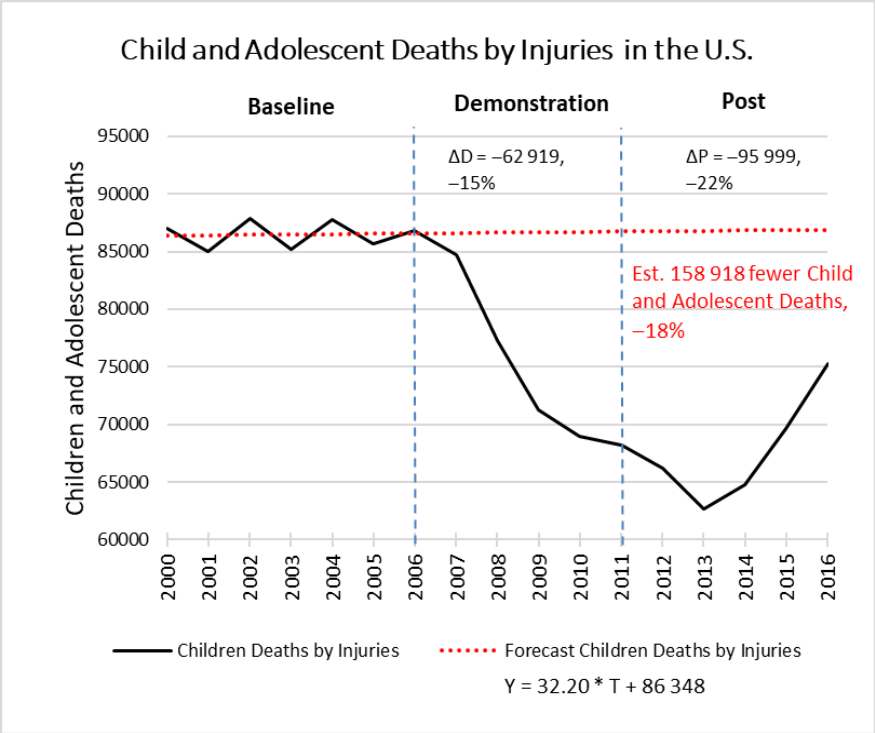

Figure 7. The number of child and adolescent deaths per year were unchanging during the Baseline period. They decreased by 158 518 fewer deaths during the Demonstration and Post periods, –18%. Then, like other variables, they began increasing from 2013 and most strikingly in 2014 when the size of the coherence creating group declined rapidly.

6.3.6 Vehicle Fatalities

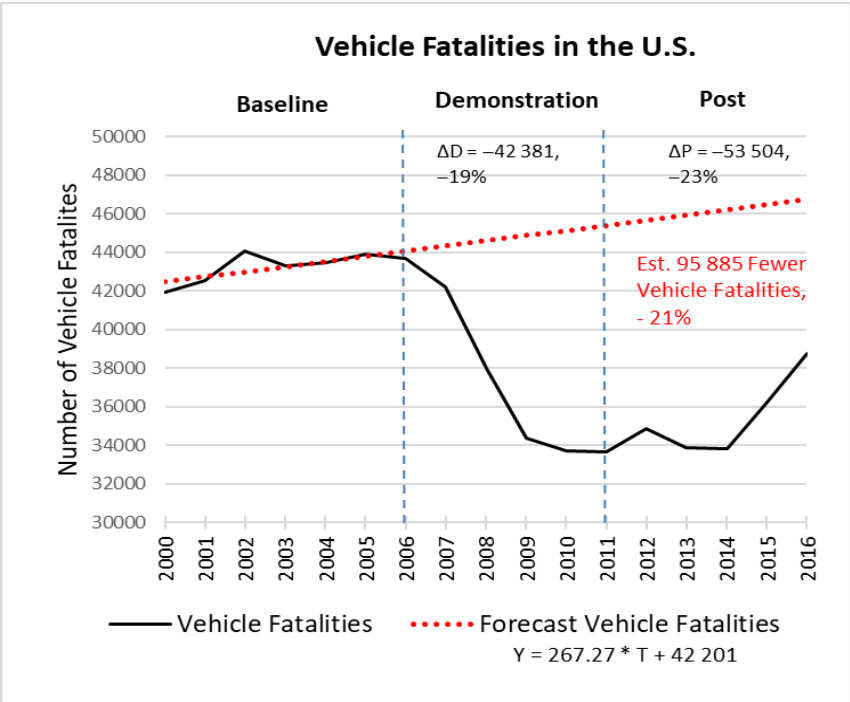

Figure 8. This chart shows a slightly rising trend in vehicle fatalities during the Baseline, then an overall 21% reduction from forecast values during the Demonstration and Post periods, 95 855 fewer fatalities. Vehicle fatalities began increasing again in 2014, when the coherence group size decreased rapidly.

Vehicle fatalities were increasing by 267.27 per year during the Baseline period, but then began to decrease during the Demonstration period, falling to 95 885 fewer vehicle fatalities than forecast during the Demonstration and Post periods. Like other variables, the big increase in vehicle fatalities began in 2014 when the size of the coherence group began dropping rapidly.

6.3.7 Infant Mortality

Figure 9 shows that infant mortality followed a similar pattern as the other variables. During the Baseline period there were a mean of 28 081 infant deaths per year, which did not systematically trend up or down in a significant way. However, one year into the Demonstration period they began to trend down, reaching a total of 31 730 fewer deaths during the Demonstration and Post periods compared to the Baseline. The slope of the downward trend becames less downward in the Post period, with a slight increase in 2014 and leveling out.

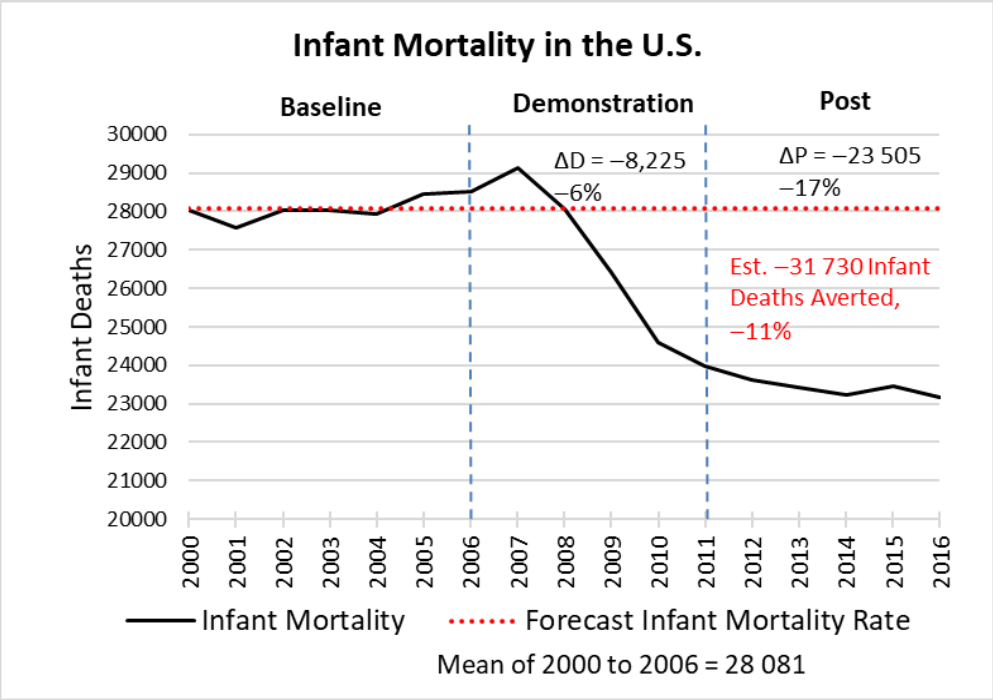

Figure 9. The linear regression on infant mortality during the Baseline period was not significant. Compared to the mean of the Baseline (28 081 deaths per year), there were 8225 fewer infant deaths during the Demonstration period and another 23 505 fewer deaths during the Post period, for a 31 730 reduction (11%) overall. From 2014 there was a slight rise and a flattening of the trend.

6.3.8 Murder

Murders in the U.S. were rising during the Baseline period by 232 murders per year. In contrast, during the Demonstration period, they decreased by 2085 per year, then leveled out in the Post period, then increased from 2014 to 2016. The number of murders in the Demonstration and Post periods combined were 16% below the values forecast from the Baseline, 28 553 fewer murders.

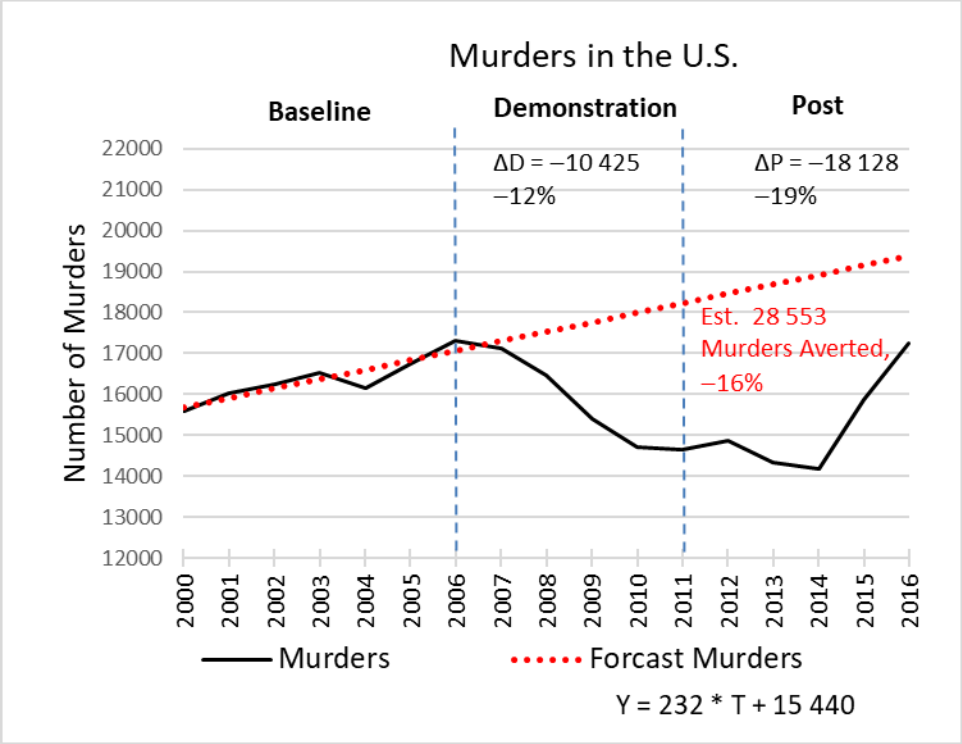

Figure 10. Murders were rising linearly during the Baseline period but decreased from forecast values by 12% and 19% during the Demonstration and Post periods, respectively, with 28 553 fewer people being murdered than forecast from Baseline trends.

6.3.9 Summary of Regression Results

In summary, regression on the seven-year Baseline period 2000 to 2006 found that three variables (vehicle fatalities, murder, and drug-induced deaths) had increasing trends. The other five variables (assaults, robberies, rapes, infant mortality, and child and adolescent deaths from accidents) were not changing systematically during the Baseline. No variables showed a decreasing trend during the Baseline. In contrast, all variables decreased during the Demonstration period, and then began to rise again during the Post Demonstration period, especially starting in 2014 when the size of the coherence creating group started decreasing rapidly. Table 6 summarizes the results from the regression analysis.

Table 6. Results of Regression Analyses for Eight Variables

Variable	Intercept (Number of Events/ Yr.)	Slope (Change in Events/Yr.)	Events Averted During Demonstration Period	Events Averted During Post Period	Total Events Averted	Total Events Averted Per Participant
Murder	15 440	232	−10 425	−18 128	−28 553	−16
Rape	93 438	0	−25 271	−28 085	−53 356	−29
Assault	879 281	0	−339 583	−609 049	−948 632	−523
Robberies	419 253	0	−72 801	−412 909	−485 710	−268
Infant Mortality	28 081	0	−8225	−23 505	−31 730	−17
Drug Deaths	16 328	3307	−33 136	−46 805	−79 941	−44
Vehicle Fatalities	42 201	267	−42 381	−53 505	−95 885	−53
Children and Adolescent Deaths by Injuries	86 348	0	−62 919	−95 999	−158 918	−88

The heavy human toll of these problems on the United States during or at the beginning of the Baseline is indicated by the first column, the intercept. For example, there were 15 440 murders, 93 438 rapes, 879 281 aggravated assaults, etc. The estimated number of events averted is substantial for all variables, 28 553 fewer murders, 53 356 fewer rapes, and 948 632 fewer aggravated assaults, to give some examples. Deaths by all these causes were an estimated 395 027 fewer.

The last column of Table 6 shows the estimated number of events per year averted on average by each member of the MIU group, estimated by dividing the average group size which was 1815. Each member of the group was responsible for an estimated 16 fewer murders, 29 fewer rapes, 523 fewer assaults, 268 fewer robberies, 44 fewer drug deaths, 53 fewer vehicle fatalities, 88 fewer child and adolescent deaths; 218 fewer deaths by these causes.

7. Discussion

7.1 Replication and Extension

There are now 20 peer-reviewed journal articles indicating that groups practicing the TM and TM-Sidhi programs together improve quality of life in a population on multidimensional variables when the group size reaches or exceeds the √1% of the population. This has been demonstrated in populations as diverse as those in North America, the Caribbean, Europe, and Asia (Orme-Johnson & Fergusson, 2018).

The present seventeen-year study of U.S. national stress replicates and extends the results of five previous papers (Cavanaugh & Dillbeck, 2017a, 2017b; Cavanaugh et al., 2022; Dillbeck & Cavanaugh, 2016, 2017). The present study consolidates all the variables studied in those papers into one analysis so their individual dynamics can be viewed together. Moreover, like Cavanaugh, Dillbeck, and Orme-Johnson (2022), this study extends the previous studies by five more years into the Post period when the size of the group fell below the required √1% to test the hypothesis that the effect would diminish when the size of the coherence creating group declined.

Another difference from the previous studies is that those studies used monthly data whereas the present study uses annual data over 17 years. Monthly data has the advantage of giving more degrees of freedom, which enables modeling the dynamics of any significant systematic intrinsic time-dependent cycles in the social indicators that need to be statistically removed before evaluating changes in trends through the regression analysis. For example, monthly data reveals strong annual cycles in most social indicators, such as highest violent crime rates during the hot months of July and August and lowest in the cold months of January and February. These annual cycles obscure the long-range (yearly) trends that are the primary interest of the current research. The use of annual data in the present study collapsed the seasonal cycles into a single point for each year, clearly revealing the annual trends over the 17-year study. Simple visual inspection through graphic analysis, as well as interrupted time series analysis, and linear regression forecasting of the annual data all revealed statistically significant and socially meaningful decreases in the long-range annual trends in all eight individual social indicators and in the composite U.S. Stress Index at or soon after the √1% threshold of TM and TM-Sidhi participants was reached. The global improvement in multi-dimensional social stress variables supports the theory that the Maharshi Effect functions from the unified field level of natural law, as replicated in many previous studies (Cavanaugh, 1987; Cavanaugh & Gelderloos, 2011; Dillbeck et al., 1988; Dillbeck et al., 1987; Hagelin, 1987; Hagelin et al., 1999; Orme-Johnson et al., 1988; Orme-Johnson & Fergusson, 2018).

Moreover, the present study, together with Cavanaugh, Dillbeck, and Orme-Johnson (2022), extends the previous four papers by Dillbeck and Cavanaugh by showing that the effect was reversed when the size of the TM and TM-Sidhi group decreased below the predicted required threshold. This onset and then reversal of the effects at or near the predicted phase transition threshold provides strong evidence for causality. The rapid change in all social indicators when the √1% threshold was reached supports a phase transition model, in which the effect does not manifest until the required number of coherently interacting elements in the system is reached (Borland & Landrith, 1977; Dillbeck et al., 1988).

7.2 Alternative Explanations

The rapid onset and then offset of the effect at the specific times predicted by theory and prior research eliminates many potential alternative explanations of the results. Most of the factors known to affect crime and the other variables are slow to change. For example, crime is impacted by poverty, lack of economic opportunities, residential instability, social networks, and proportion of adult males ages 18-24 in the population, but these factors all change slowly over many years (Dillbeck et al., 1988; Dillbeck et al., 1981). In the present study, these factors could not explain the observed rapid decrease of crime during the Demonstration period and subsequent increase in the Post

period, much less the simultaneous change in the predicted directions in multidimensional variables, a phenomenon that has been repeatedly observed in prior studies on the Maharishi Effect (Orme-Johnson & Fergusson, 2018).

Other factors that influence crime, such as police strategies, prison populations, and use of surveillance technology, are not viable explanations for the scale of the changes in crime trends during this study, much less for all variables. Unless new police strategies and surveillance technologies had been implemented on a national scale at the requisite times and then reversed at the requisite times of the Demonstration and Post periods, these variables would not account for the specific trend changes observed.

Some variables that predict crime were in fact moving in the opposite direction of what would be predicted from current stress-producing conditions in the U.S. In fact, during the Demonstration period, more prisoners were released, and unemployment was high. Historical data has predicted that these conditions would increase crime, yet crime decreased during the Demonstration period (Cavanaugh & Dillbeck, 2017b; Dillbeck & Cavanaugh, 2016). Other explanations for the observed decrease in murder rates, such as declines in inflation and increases in ambient temperature, have also been shown to be implausible (Cavanaugh et al., 2022). To explain the reversal of the effects, any alternative explanation would have to have been reversed at the time when the size of the TM and TM-Sidhi group declined.

Another consideration is the rise of the internet. A high level of interconnectedness within and between societies has emerged in the past two decades, expressed in social media and seen in the more instant communication of events nationally and internationally. However, social media does not explain the present results because previous research from the 1980's and 1990's before the boom in social media also demonstrates the √1% effect (Dillbeck, 1990; Dillbeck et al., 1988; Dillbeck et al., 1987; Hagelin et al., 1999; Orme-Johnson et al., 1988).

The administration of President Obama implemented many new policies for social change, but this could not explain the results because the Demonstration period began in 2006 and Obama did not come to office until 2009. By 2009, the decrease in U.S. national stress had already been underway for two years. Moreover, the onset of the Post period and the increase in U.S. stress began well before the end of Obama's second term in 2016, ruling out change in government administration as an explanation of the results.

7.3 Implications for Social Dynamics

According to Maharishi's theory of social dynamics, government is the "innocent mirror of collective consciousness" (Maharishi Mahesh Yogi, 1995). This means that the style of government that emerges to rule a population depends on the level of coherence of the population as a whole. A mature population with a sufficient proportion of citizens functioning at the level of principled moral reasoning and beyond would be largely self-regulating and institutions of repression and control would be minimized. On the other hand, a predominantly immature population with narrow understanding of the political issues and of the consequences of their actions will result in government that must restrict peoples' freedom and expand the use of various means of social control and regulation, including force if necessary, to maintain order in society. In this view, if coherence is not created in collective consciousness, removing repressive leaders can only result in similar leaders rising to take their place.

Previous studies have documented the effects of √1% groups on government. For example, in 1993, John Hagelin and colleagues assembled 4000 TM and TM-Sidhi participants and located them in groups throughout the capitol Washington D.C. area. Predictions were made in advance to an independent project review board of scientists, community leaders, and the police that the study would reduce crime by 20%. They also predicted improved quality of life in the city and increased harmony in government. Compared to baseline trends for that year, violent crime decreased 23%. Like the present study, the effect was reversed when the group left town (Hagelin et al., 1999). Rachel Goodman and colleagues found that the D.C. study improved the quality of life in the city, indicated by reduced psychiatric emergency calls, trauma cases, accidental deaths, and complaints against the police (Goodman, Orme-Johnson, Rainforth, & Goodman, 1997, 2012).

Of particular interest with regard to the effects of collective consciousness on government, Goodman also found that media coverage of the Clinton administration became more positive during the project. Declining trends in Clinton's approval ratings in polls suddenly turned around and became more positive when the √1% group was in the city. This indicates that the systemic relationship between individual citizens and their government became more harmonious (Goodman et al., 1997, 2012). When the group left, the effect decreased to prior levels of crime (Hagelin et al., 1999).

Related, Gelderloos and colleagues found that during 1985-1987, U.S. presidential statements by President Reagan about U.S./Soviet relationships improved when the size of the U.S. √1% groups increased. More positive presidential

statements occurred after the group size increased, supporting the interpretation that the increased coherence in collective consciousness was causing the president to perceive relationships with the Soviets from a more fundamental level of natural law where harmony predominates, resulting in more positive statements (Gelderloos, Cavanaugh, Frid, & Xue, 2019; Gelderloos, Frid, Goddard, Xue, & Loliger, 1988).

A second study of U.S./Soviet relations by Gelderloos and colleagues covering the period 1979-1986 used independent data from the Zurich project on East-West relations. During periods when the group was large enough to create coherence in the U.S., then the American government's statements and actions towards the Soviets became more positive. When the groups were even larger, large enough to predict that the coherence would reach the Soviet Union, then the statements and actions of the Soviet government towards the U.S. became more harmonious (Gelderloos, Cavanaugh, & Davies, 1990).

The series of four empirical papers on this social experiment by Dillbeck and Cavanaugh (Cavanaugh & Dillbeck, 2017b; Dillbeck & Cavanaugh, 2016) and a fifth paper by Cavanaugh et al. (2022) provide further discussion of possible alternative explanations for the improvements in national stress indicators found during the period 2007-2010 when the size of the TM-Sidhi group at MIU exceeded the square root of 1% of the U.S. population

7.4 The Role of Citizens and the Responsibilities of Government

Maharishi's theory of collective consciousness provides a new perspective for discussions of the role of citizens and the responsibilities of government to educate them. In Maharishi's view, whatever the form of government—democracy, republic, monarchy, communism, or dictatorship — every individual in society automatically contributes to collective consciousness according to their level of consciousness. Stressed people add stress to collective consciousness, coherent people add coherence, and the influence of coherence is more powerful than incoherence. Whatever the mode of governmental organization, its decisions and actions are ultimately guided by the collective consciousness of the entire population. Therefore, the primary responsibility of any kind of government is to provide effective, evidence-based technologies to reduce stress. This is the ultimate grass-roots approach to government, culture free, and universally true (Maharishi Mahesh Yogi, 1977a, 1995).

In the Declaration of Independence, Thomas Jefferson famously wrote: "We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness." Interpreted in the light of Maharishi's theory of collective consciousness, "Self-evident" has its most profound meaning as the experience of the transcendental infinite Self at the basis of every person's mind (Maharishi Mahesh Yogi, 1969). Moreover, it is only at the transcendental level that the phrase "all men are created equal" is universally true. Whatever our relative differences, at our core, we are all pure unbounded creative intelligence. As we noted earlier, recognition of this ultimate reality has been at the center of virtually all civilizations, as unlimited eternal *Being* in the Vedic tradition of India, as the *One, the Good, the Beautiful* of Plato, as *Being* for Aristotle, as the *Kingdom of Heaven Within* in the Christian tradition, as the *Absolute* of the philosopher Hegel and as the *Oversoul* and *Self of all Beings* of the American Transcendentalists, Emerson, Thoreau, and Whitman (Anderson, 2010; Pearson, 2012).

Thomas Jefferson adopted the idea that "all men are created equal" from 18th-century European Enlightenment philosophers. But this was primarily an *intellectual* movement, a beautiful idea, not a practical reality whereby individuals had effective means to directly cultivate their transcendental Self on a daily basis to habituate the system to maintain the experience as a higher level of physiological and psychological integration for greater resilience in life. For the Enlightenment philosophers, *Being* was mostly something to talk about. A few individuals had inspiring transcendental experiences, such as Wordsworth and Thoreau while they were in nature or as reflected in poetry by Whitman (Pearson, 2012). These glowing experiences fueled the philosophy. But there was nothing widely available like the Transcendental Meditation technique, which can produce transcending experiences routinely for everyone, twice daily. Now we have a host of scientific research showing that the experience is associated with a unique physiological pattern that is different from waking, dreaming, and sleep; that it is in the opposite direction of stress; and that it has enormous practical benefits for mental and physical health (Orme-Johnson, 2021) as well as for society as a whole (Orme-Johnson & Fergusson, 2018).

Maharishi's field-theoretic view of society clearly identifies that *the duty of citizens* is to reduce their own level of stress and increase their contribution of coherence to collective consciousness. Likewise, it identifies that the *responsibility of government* is to include programs of effective evidence-based transcending and stress reduction in public education so that every citizen can learn this valuable life skill. By increasing coherent brain functioning, learning ability, and creativity, such programs would complement curricula designed to teach skills in evaluating fake news and political spins, and how to effectively engage in the political process (Bole & Gordon, 2009). Whereas

other programs focus on improving the content of education, skill in transcending expands the container of knowledge, the ability of the student to comprehend and remember. In the following quotation, Maharishi expresses how simple it would be to create world peace and start the world on the path to an enlightened civilization just by creating even a single group of the √1% of the world population transcending in one place. Maharishi (1986b) explains:

> Through the influence created by just one group of 8000 experts in the Technology of the Unified Field the world consciousness will always remain purified. It is like having one washing machine in a village. All the people are making their clothes dirty, and one washing machine keeps on cleaning them. One group of 8000 will be like that one washing machine. (p. 80)

8. Conclusion

High levels of violence and stress persist throughout the world today. This has motivated us to implement and evaluate Maharishi Mahesh Yogi's theory and technologies to create coherence in collective consciousness for addressing these problems on the population level. Many concepts of collective consciousness have been proposed throughout history in philosophy, the social sciences, and recently in quantum field theory. Maharishi's theory provides well-defined technologies for implementation and posits specific testable hypotheses. It holds that group practice of the Transcendental Meditation and TM-Sidhi techniques by the √1% of a population creates coherence in those individuals, thus radiating an influence of coherence into the population. We have reviewed the evidence that this practice increases "coherence" in the individual, as operationally defined in terms of many measurement domains, e.g., reduced mood disturbances, improved health, and reductions of serious public health problems such as PTSD, and prison recidivism.

We have presented the results of a 17-year demonstration study. It found that during the years in which a coherence creating group in Iowa reached or exceeded the size predicted to create coherence for the entire United States, there were immediate and simultaneous reductions in multiple national statistics of stress, indicating less overall crime, accidents, and health problems. The holistic effect across many social indicators suggests that the effect was on the level of the underlying unified field. Graphic analysis, interrupted time series regression analysis, and linear regression forecasting analysis found that the results were highly statistically significant and substantial, predicting that the demonstration prevented thousands of deaths.

This approach constitutes a paradigm shift that challenges the perspective that social dynamics are restricted to cognitive and behavioral levels. In this field-theoretic model of society, thinking and behavior in society are interconnected and guided by an underlying field of collective consciousness. Creating coherence in that field can change the trends of time to a more positive direction. Theories based on a limited version of the materialistic world view cannot explain the results of the now over 50 studies on this new technology.

What is needed now is a global demonstration of the effect of a group of 10 000 TM and TM-Sidhi participants, approximately the √1% of the world's population, on its long-term effects on reducing war, violence, health issues, and other problems and increasing harmony and creativity on a global scale. Given that engineering requires a factor of safety, for example 6 or 7 times for buildings and bridges, we recommend that as a safety factor, groups of 10 000 or more be created on each of six continents, North America, South America, Africa, Europe, Asia, and Australasia. The measurable predicted effect would be an unprecedented era of peace, creativity, prosperity, and mutual respect in the world.

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