Research Article

Effects of short-term medical mission trips to Chiapas, Mexico, on the religiosity of the missionaries

KATHERINE A. MEIDL , JOSEPH M. MEIDL, LAURA R. MEIDL, AND
ERIK J. MEIDL

The Hannibal Clinic, Hannibal, MO, USA

This study evaluates the effects that short-term, foreign, Catholic medical mission trips had on the religiosity of the United States-based participants. The subjects of this study participated in Catholic medical missions to Chiapas State, Mexico, in 2014 and 2015. Twenty-two of forty-two participants responded to a survey to assess for any changes in their religiosity and associated attitudes and behaviors. The results revealed that participation in the medical mission was associated with a significant increase in non-organizational religious activity, intrinsic religiosity, concern for health disparities and the burden of illness in the developing world, the promotion of further missions, the provision of service and/or monetary aid to the poor in the missionary's local community, and an increased likelihood to discuss the Christian faith in conversations with others. There was no statistically significant association with organizational religious activity or local participation in evangelization activities.

Summary: *This article reports on the changes seen in the religious attitudes and charitable works performed following participation in a short-term medical mission. After serving on a mission trip to Mexico, we found that United States-based missionaries had an increase in their private religious activities, felt closer to God, were more likely to help the poor in their own neighborhoods, and were more likely to discuss their Christian faith than prior to the mission trip. We discuss possible reasons for these changes.*

Keywords: Religiosity, Medical missions, Non-organizational religious activities, Intrinsic religiosity, Organizational religious activity, Charity, Evangelization

INTRODUCTION

Short-term medical mission trips have become increasingly popular in recent years. In 2008, Maki et al. estimated that 543 organizations sent approximately six thousand medical missions per year from the United States to foreign countries with an average per year expenditure of \$50,000 per mission (Maki et al. 2008, 122). These medical mission trips provide tangible

benefits to the local populations served in terms of the medical treatment of acute and chronic conditions, health education, and the provision of pharmaceutical supplies. Medical missionaries work to promote the health and well-being of people in often impoverished and medically underserved regions of the world. Faith-based medical missionaries also use their charitable actions to promote good will, understanding, and their religious beliefs.

The medical benefits to the population served of short-term mission trips have been best documented in surgical missions. Missionary surgical teams have been able to reduce the suffering and disability for a variety of conditions at generally acceptable costs and complication rates. This includes surgeries for cleft lip and palates (Ott and Olson 2011), pediatric tympanoplasty (Isaacson and Melaku 2015), orthopedic surgical procedures (Chen et al. 2012), hand surgeries (Tadisina et al. 2014), tonsillectomies (Sykes et al. 2012), gynecological and general surgical procedures (Egle et al. 2014), and pediatric neurosurgery (Davis et al. 2014). Healthcare outcomes for short-term medical missions have not been as well studied. Patients in varied communities however have demonstrated acceptance and appreciation for non-surgical medical care provided by missionary teams (Alghothani et al. 2012; Sanchez et al 2015; Weng et al. 2015).

Ethical concerns have been raised regarding short-term medical mission trips. Some researchers have questioned whether physicians on some medical mission trips are able to fulfill their duty to safeguard the health of the patients they treat as outlined in the World Medical Association's Declaration of Helsinki (Holt 2012; World Medical Association 2016). In particular, researchers have questioned whether informed consent and proper education are being provided given time constraints with large volumes of patients being seen along with language and cultural barriers (Berry 2014; Chiu et al. 2012, 37; Chiu et al. 2014; Holt 2012; Stone and Olson 2016). The quality of the care provided, whether due to relative inexperience of the medical missionaries especially regarding local diseases and their manifestations, lack of diagnostic testing, or lack of follow-up opportunities has been raised as an area of

concern (Bartelme 2015; Maki et al. 2008, 121; Naujokas 2013). Finally, ethical concerns have been raised regarding the sustainability of short-term medical missions in providing health care to the populations served (DeCamp 2011; Green et al. 2009, 4). Do the missions detract from the care provided by local medical networks? Does the provision of free health care by mission groups decrease the incentive of governmental or local provider organizations for improving the local health care infrastructure? Creating partnerships with local medical care networks for referrals for further testing and follow-up is a necessary element of any ethical medical mission. But to prohibit or discourage the provision of medical care to indigent and medically underserved populations while waiting for the development of better healthcare delivery systems would also pose ethical concerns, as argued by Barbara Ott and Robert Olson:

It has been suggested that short-term surgical missions can be inappropriate when they provide temporary solutions that may not address root causes of health problems. However, waiting for low-income nations to change priorities to increase the overall health of their citizens undervalues the current human experience of their suffering. (Ott and Olson 2011, 106)

An aspect of short-term medical mission activity that so far has had little investigation is the effect the mission experiences have on the medical missionaries themselves. Intimately working with patients in impoverished areas might be expected to affect the participants' understanding of global healthcare resource disparities. The experiences might also affect the future willingness of the medical missionaries to raise money or promote charitable mission activity in foreign countries. It might also influence the

missionaries' willingness to donate money and time in their local communities in the United States. Effects of a short-term foreign medical mission on the religiosity of the missionaries has not been well studied. In this paper, we report the effect short-term medical mission trips to Chiapas State, Mexico, had on the religiosity, concern with global healthcare resource disparities, and charitable works of the United States participants of these missions.

BACKGROUND

The mission trips studied were based in San Cristobal de las Casas and the surrounding mountain villages in Chiapas State, Mexico. Chiapas is the southernmost state of Mexico, sharing a border with Guatemala. In general, it is a mountainous region with abundant rainfall (Explorando Mexico *n.d.*; Parker 2004, 15; Standish 2009, 51). One quarter of the population speaks an indigenous Mayan-based language (History.com 2009; International Encyclopedia of the Social Sciences 2008; Standish 2009, 51). Approximately 60 percent of the residents of Chiapas are Roman Catholic (Cuén-tame *n.d.*; International Encyclopedia of the Social Sciences 2008; United States Department of State 2006), in contrast to Mexico as a whole with 82.7 percent Roman Catholic (Central Intelligence Agency 2015). Protestant denominations comprise 21.9 percent according to the year 2000 census (Standish 2009, 50–1; United States Department of State 2005). A mix of Catholicism and ancient Mayan religion can also be found, for example, in San Juan Chamula, a town just outside of San Cristobal de las Casas (Preston and Dillon 2004, 442; Voice of America 2009). There is now a Muslim center in San Cristobal de las Casas across the

street from the Franciscan hospital mission base with four hundred Muslims residents in Chiapas as of 2013 (Hadjian 2013).

According to United States government data (Central Intelligence Agency 2015), per capita income in Mexico is approximately one-third that of the United States at \$18,000 (2014 estimate). Health expenditures are 6.2 percent of GDP (2013) compared with 17.1 percent of GDP in the United States. Mexico has 2.1 physicians per 1000 population and 1.5 hospital beds per 1000 population compared with the United States with 2.45 physicians per 1000 population and 2.9 hospital beds per 1000 population. Chiapas is the poorest state in Mexico with a 2014 GDP per capita of \$2,871 using currency conversion rates as of January 23, 2016 (Secretaria de Economia 2016). In Chiapas, there is a greater scarcity of healthcare resources with 0.94 physicians per 1000 population (Partners in Health, 2015) and 0.4 hospital beds per 1000 population (Hernandez 2014). In 2010, 57 percent of the population of Chiapas could not gain access to healthcare services due to a lack of doctors, lack of medicines, or distance to the closest hospital (Sipaz 2012). Chiapas also consistently has Mexico's highest levels of malnutrition and infant mortality (Merrill and Miro 1997, 134; Standish 2009, 50). The life expectancy is also lower than the national average (Parker 2004, 31).

The authors studied Catholic, faith-based medical mission trips to San Cristobal de las Casas in late May of 2014 and late May of 2015 conducted by Helping Hands Medical Missions based in Irving, Texas. The mission clinics were held at the Franciscan Hospital de Caridad and in community centers in several surrounding villages within a two-hour drive from San Cristobal. The May 2014 mission had clinics for five days, while clinics were

Figure 1. Age distribution of the Chiapas missionaries

held for six days during the May 2015 mission. Each mission also included a retreat for one morning followed by three hours of door-to-door evangelization. The missionaries attended Mass every morning of the mission. There was also time in the evening to discuss experiences of the day and to conduct a brief discussion of Catholic teachings. Evening prayers were said as a group each night.

There were twenty-six missionaries from the United States who participated in the 2014 mission to San Cristobal de las Casas: three physicians, one pharmacist, two pharmacy techs, nine registered nurses, one physical therapy assistant, one translator, eight student volunteers, and one priest-chaplain. The 2015 mission to San Cristobal de las Casas had twenty-four missionaries from the United States: four physicians, one pharmacist, two physician assistant students, four registered nurses, four translators, eight student

volunteers, and one priest-chaplain. With some missionaries participating in both missions, the total number of US missionaries who participated in one or both missions were forty-two.

The demographics of the forty-two surveyed missionaries from the 2014 and 2015 mission trips to Chiapas, Mexico, are presented in figures 1 through 6. Twenty-two of the forty-two Helping Hands San Cristobal de las Casas missionaries responded to the survey request (52%). Specific demographic characteristics of the respondents to the survey could not be ascertained due to the anonymous nature of the survey (figs. 2–6).

The missions also had a ground-organizing group from the local diocese evangelization team which included a pharmacist. The ground team together with the Helping Hands Missions international mission coordinator organized the clinic locations with local community

Figure 2. Gender of the Chiapas missionaries

Figure 3. Ethnicity of the Chiapas missionaries

Figure 4. Religious affiliation of the Chiapas missionaries

Figure 5. Occupation of the Chiapas missionaries

leaders and provided logistical support for housing, food, and transportation. The ground crew served as translators and were able to purchase more medical supplies as needed. The ground team also helped with referrals to local healthcare providers and tertiary hospitals when necessary. The 2014 mission treated 800 patients. The 2015 mission treated 919 patients. The

missionaries treated a wide variety of medical conditions including some unusual cases. The most common conditions treated were osteoarthritis, gastritis, gastroesophageal reflux, hypertension, diabetes mellitus type 2, depression, asthma, allergic rhinitis, parasites, malnutrition, respiratory infections, diarrhea, headaches, presbyopia, and myopia.¹

Figure 6. State of residence of the Chiapas missionaries

The missions had a pharmacy at each of the clinics which was able to give free-of-charge prescription and non-prescription medications to the patients. These medications were dispensed for new complaints and chronic health conditions. During the 2014 mission trip, Helping Hands Medical Missions provided \$1,908 in prescription medicine. The prescription medicines provided for the 2015 medical mission was \$2,256 (as per email correspondence from Gloria Madrigal (2015), Helping Hands Medical Missions, December 28). The authors estimate that approximately \$800 in non-prescription medications were dispensed during each mission in addition to donated prescription glasses, coloring books, and other games for children. The priest-chaplain and the missionaries also provided spiritual support to the patients and their families.

METHODS

An email was sent to each of the forty-two United States-based participants of the medical mission trips to Chiapas, Mexico, in December 2015 with a link to the study survey on SurveyMonkey.com. A reminder email to complete the survey was sent out

approximately one week later. Data was compiled anonymously using the SurveyMonkey.com site. Twenty-two of the forty-two missionaries responded to the survey. Answers to questions one and five were not completed by one respondent to each question, otherwise all other answers were completed. With twenty-six missionaries having completed their first Chiapas, Mexico, mission nineteen months prior to the survey and sixteen missionaries having completed their first Chiapas, Mexico, mission seven months prior to the survey, the mean length of time between the first Chiapas mission to the survey was 14.4 months.

The survey was comprised of twenty-two questions. The first ten questions came from the DUREL (Duke University Religion Index) to assess religious involvement before and after the mission trip (Koenig et al. 1997). The DUREL instrument has three subscales measuring organizational religious activity (ORA), non-organizational religious activity (NORA), and intrinsic religiosity or subjective religiosity (IR). The DUREL index has been extensively tested for reliability and validity and has been utilized in over one hundred published studies (Koenig and Bussing 2010,

78–85). Questions eleven and twelve measured the effect the mission trip had on the missionary's concern over health disparities and the burden of illness in the developing world. Questions thirteen, fourteen, nineteen, and twenty evaluated the effect of the mission trip on personal missionary evangelization. Questions fifteen and sixteen evaluated the effect of the mission trip on the missionary's further mission promotion or participation. Questions seventeen and eighteen sought to determine the effect of the mission trip on service and monetary aid to the poor in the missionary's local community. Questions twenty-one and twenty-two were yes/no response questions to determine if the missionary felt the mission trip made him or her a better person and or closer to God. For the non-polar questions eleven to twenty, answers were weighted from one to five for questions eleven and twelve, and one to six for questions thirteen to twenty based on the level of concern for health disparities in questions eleven and twelve and the frequency of occurrence of queried activities in questions thirteen to twenty.

Statistical analysis of the data was performed with IBM SPSS Statistics software. A sign test was utilized for the statistical analysis of the DUREL portion of the survey. This nonparametric test was chosen because a parametric statistical test requires that the population distribution of difference scores must be normal for small samples and that the data be interval data (Gravetter and Wallnau 2014, 313–30; Jamieson 2004). Both of these assumptions were violated with this data. The sample contained less than thirty people, so this is considered a small sample (Gravetter and Wallnau 2014, 313–30). After performing a Shapiro-Wilk test, a significance of less than 0.001 was found, showing that the distribution was not normal. In addition, Likert-like questions were used, and a

typical Likert scale is a 5- or 7-point ordinal scale used by respondents to respond to the question in a rated scale (Sullivan and Artino 2013). In an ordinal scale, the responses can be rated or ranked, but the distance between the response options cannot be measured because we cannot assume that the difference between responses is equidistant (Sullivan and Artino 2013). Interval data has a difference between responses that can be calculated (Sullivan and Artino 2013). Some experts argue, that if there is an adequate sample size with data that are normally (or nearly normally) distributed, parametric tests can be used with Likert-scale ordinal data (Jamieson 2004). Since the data are not normally distributed and a Likert scale was used, parametric tests should not be applied. Due to these violations, a nonparametric test, such as a Wilcoxon signed-rank test or a sign test, was chosen to analyze the first ten questions.

A Wilcoxon signed-rank test does not assume normality in the data, so it can be applied to data sets that are not normal (Lund Research Limited 2013a). It is used to compare two sets of scores that come from the same participants in the same way as a repeated measures t-test (Lund Research Limited 2013a). There are three assumptions of the Wilcoxon-signed ranks test: the dependent variable is measured on an ordinal scale, the independent variable consists of two related groups, and the distribution of the differences is symmetrically shaped (Lund Research Limited 2013a). All data matched the first two assumptions; however, the third assumption was not met by all the questions. Upon review of the distribution of differences in each before-and-after question response, it was found that the distribution of differences was not symmetrical for all questions. For the questions that did not have a symmetric distribution, a sign test was used. This test determines if the

Table 1 Survey results grouped by question category with scores assigned by missionaries about participation or intensity before and after the mission experience

Question category	Frequency of participation or intensity of sentiment*					
	1	2	3	4	5	6
Organizational religious activity	Before: 0 After: 0	Before: 0 After: 0	Before: 2 After: 1	Before: 1 After: 2	Before: 12 After: 12	Before: 6 After: 7
Non-organizational religious activity	Before: 1 After: 0	Before: 2 After: 1	Before: 0 After: 1	Before: 7 After: 2	Before: 9 After: 8	Before: 3 After: 10
Intrinsic religiosity	Before: 0 After: 0	Before: 6 After: 1	Before: 5 After: 5	Before: 34 After: 24	Before: 20 After: 36	N/A
Concern over health disparities in the developing world	Before: 0 After: 0	Before: 7 After: 1	Before: 3 After: 0	Before: 7 After: 5	Before: 5 After: 16	N/A
Personal missionary evangelization	Before: 8 After: 4	Before: 7 After: 4	Before: 11 After: 14	Before: 7 After: 6	Before: 4 After: 8	Before: 7 After: 8
Future mission promotion or participation	Before: 9 After: 3	Before: 5 After: 5	Before: 7 After: 10	Before: 1 After: 2	Before: 0 After: 1	Before: 0 After: 1
Service and monetary aid in the missionary's local community	Before: 1 After: 1	Before: 5 After: 1	Before: 6 After: 5	Before: 6 After: 8	Before: 2 After: 3	Before: 2 After: 4
Person feels mission trip made him/her a better person	Yes: 20	No: 2	N/A	N/A	N/A	N/A
Person feels mission trip made him/her closer to God	Yes: 22	No: 0	N/A	N/A	N/A	N/A

• 1 = no activity or sentiment, 5 or 6 = maximum activity or sentiment.

Note: The least level of frequency of activity or intensity of sentiment is 1. Some questions were rated on a 1–6 scale and others on a 1–5 scale. Questions rated on a 1–5 scale have N/A listed under the six column. Two categories contained yes/no questions, and this is indicated in those rows. The data contained in the boxes are the number of mission participants who assigned the number in the column header (1–6 or 1–5) to describe their level of frequency of activity or intensity of sentiment.

median difference between pre- and post-survey responses is statistically significant and can be used when a Wilcoxon signed-rank test cannot be applied (Lund Research Limited 2013b).

Following this reasoning, an exact sign test was also utilized for questions eleven and twelve. A Wilcoxon signed-rank test was used to analyze questions 13–16. Questions 17–20 were then measured using a sign test.

The answers for questions twenty-one and twenty-two were presented as the raw data without further statistical analysis.

RESULTS

The survey question results are presented in Table 1.

The questionnaire results were analyzed first for the effect the mission trip had on the three major dimensions of religiosity using the Duke University Religion Index (DUREL). An exact sign test was used to compare the differences between participants' scores in organizational religiosity before and after the medical mission. The medical mission was not associated with a statistically significant median difference in the pre- and post-scores, $p = 0.500$. The DUREL index for non-organizational religious activity (NORA) increased after the medical mission. An exact sign test compared the differences between participants' scores in non-organizational religiosity before and after the medical mission, and the test revealed a statistically significant median difference between scores, $p < 0.0001$.

Table 2 Summary of survey question category statistical results

Survey category	Statistical test	Results	Statistically significant
Organizational religious activity	Sign	$p = 0.50$	No
Non-organizational religious activity	Sign	$p < 0.0001$	Yes
Intrinsic religiosity	Sign	$p < 0.0001$	Yes
Concern over health disparities in the developing world	Sign	$p < 0.0001$	Yes
Participation in local evangelization	Wilcoxon signed ranks	$Z = 1.260$ $p = 0.208$	No
Future mission promotion or participation	Wilcoxon signed ranks	$Z = 3.090$ $p = 0.002$	Yes
Service and monetary aid in the missionary's local community	Sign	$p = 0.001$	Yes
Discuss Christian faith with others	Sign	$p = 0.001$	Yes

To compare the differences between participants' scores in the DUREL index for intrinsic religiosity before and after the medical mission, an exact sign test was utilized. This showed that participating in a medical mission was associated with a statistically significant median difference between scores, $p < 0.0001$.

Participation in a medical mission was also shown to be associated with an increase the participants concern for health disparities and the burden of illness of the developing world. According to an exact sign test, medical mission participation was associated with a statistically significant median difference between scores, $p < 0.0001$.

The foreign medical mission activity was not associated with a statistically significant change in local participation in evangelization activity (Wilcoxon signed-ranks test having $z = +1.260$, p value = 0.208). It was, however, associated with a statistically significant change in promoting further mission activities in regard to recruitment, monetary aide, or further personal volunteering for other missionary activity (Wilcoxon Signed-Ranks Test having $z = +3.090$, p value = 0.002).

After participating in the Chiapas medical mission, the missionaries were

more likely to provide service and monetary aid to the poor in the missionary's local community, eliciting a statistically significant median difference between scores using an exact sign test, $p = 0.001$. Past missionaries were also more likely to discuss their Christian faith in their conversation with others. The median difference between reported scores was statistically significant according to an exact sign test, $p = 0.001$.

The missionaries were also asked if they felt the medical mission trip to Chiapas, Mexico, made them a better person. Ninety-one percent of the respondents felt that the experience did make them a better person. In further support of the DUREL intrinsic religiosity index findings noted above, the medical mission participants were unanimous in their feelings that the mission trip brought them closer to God (table 2).

DISCUSSION

This study found that participation in a foreign medical mission was strongly associated with an increase in non-organizational religious activity and

intrinsic religiosity. Following a medical mission, participants were more likely to spend time in private religious activities such as prayer, meditation, or Bible study (non-organizational religious activity). They also had a deeper intrinsic religiosity through having a greater sense of experiencing the presence of God and feeling closer to God. Mission participants also allowed their religious beliefs to play a greater role in other aspects of their life. There was no associated increase in organized religious activity following the medical mission trip. This may be due to ceiling effect with a high level of baseline organized religious activity in mission participants prior to traveling to Chiapas.

Many reasons could be proposed for this increase in religiosity. Experiencing the faith of patients who often live in difficult life circumstances can be inspiring. Treating patients who would otherwise not be able to receive medical care could make the missionary feel closer to God. The missionary might feel he or she was listening to God's call and fulfilling a divine plan. Interacting with other medical volunteers and sharing faith stories can also reinforce and strengthen the missionary's belief system. Having a priest on the mission trip who held formal and informal discussions with the missionaries involving faith and doctrinal issues likely also played a significant role in increasing the religiosity of the missionaries. Setting aside time for door-to-door evangelization may have forced the missionaries to explore the reasons they hold Christian beliefs.

Being a medical missionary may also have helped the survey respondents feel closer to God by fulfilling the Gospel's missionary commission:

Go into all the world and preach the gospel to the whole creation. He who believes and is baptized will be saved; but he who does not believe will be condemned. And

these signs will accompany those who believe: in my name they will cast out demons; they will speak in new tongues; they will pick up serpents, and if they drink any deadly thing, it will not hurt them; they will lay their hands on the sick, and they will recover. (Mk 16:15–18)

Delving deeper into the gospel writings, miracles play a prominent role. In the gospels, Jesus shows that he is the Lord by, among other things, performing miracles, 103 were recorded. Fifty-five of them were medical (healing the sick, giving sight to the blind, allowing the paralyzed to walk), twenty-seven were natural miracles (feeding a crowd, turning water into wine, calming a storm), and twenty-one were exorcisms (casting out demons). And so a majority of the recorded miracles were medical in nature (53%). As mentioned above, there is a high level of baseline organized religious activity in mission participants prior to traveling to Chiapas, therefore, it is fair to assume that participants are familiar with Jesus' medical miracles. Consequently, medical mission participants might have an increase in their intrinsic religiosity following the mission experience because they may feel they have been following Jesus' example of healing the sick.

Experiential learning during the mission trip about people of another culture also likely accounts for the increase in concern for health disparities and the burden of illness in the developing world. Meeting and forming friendships with individual people in Chiapas can put a human face on the challenges being faced by people in different parts of the world. This reason may also explain the finding that the missionaries are more willing to provide aid or volunteer for further foreign medical missions. These types of experience may also explain the increased willingness of mission participants to provide service and

financial aid to impoverished people in their own areas of residence.

In reviewing prior publications, we were unable to identify other studies that evaluated the effects of either short-term medical or Catholic mission trips on religiosity of mission participants. There have, however, been studies that evaluate the association of short-term, Protestant non-medical mission trips with aspects of religiosity. Kathryn Tuttle in her 1998 Ph.D. dissertation for Biola University (Tuttle 1998, 224–53) investigated the effect of short-term, non-medical mission trips on the spiritual growth of students attending evangelical Protestant Christian colleges. Her study had many similar findings to our study. In interviewing the college students, she found that those who went on short-term mission trips listed that experience as the most important college experience in promoting spiritual growth. Ms. Tuttle reports that the mission trip was a rich, first-time look into another culture that encouraged the students to reevaluate their values, goals, and priorities. These students also felt the mission experience gave them more faith in God's plan, and they relied on God more. They experienced a greater prayer life. They experienced more compassion for those in need. They were better able to share their faith. They also were more likely to participate in future mission activities. And they reported their belief that service to others is a submission to the primary focus of Scripture. These findings correspond with our study findings of an increase in non-organizational religious activity and intrinsic religiosity after participating in a short-term, medical mission trip.

Roger Peterson surveyed participants of one-week, non-medical, Protestant missions in the 1980s (Peterson and Peterson 1991, 6–19). The survey response rate was 38.7 percent. He found that the

respondent's prayer time for missions/world evangelization doubled, financial giving to missions increased, and their perception of commitment to world missions increased. This study again seems to support an increase in non-organizational religious activity and internal religiosity.

Similar findings were seen in a pre- and post-mission survey of participants in non-medical, Protestant missions to Romania in 1994 (53% survey response rate) in which surveyed first-time participants reported increasing their personal prayer for missions (an aspect of non-organizational religious activity) by 56 percent, but their time spent in communal prayer (an aspect of organizational religious activity) and financial giving did not change (Kirby 1995; Ver Beek 2007, 6).

A United Methodist 9-day building project, non-medical mission trip to Mexico found that the survey respondents reported an increase in Bible reading and personal prayer time following the mission (non-organizational religiosity) (Wilson 1999, 57). Manitsas reported data on twenty-five Baptist missionaries to Mexico in 2000. He found the respondents felt closer to God and more committed to Christian service (aspects of intrinsic religiosity) (Manitsas 2000, 38). They stated that they were more likely to participate in future mission trips.

A study of evangelical Christian adolescents from the United Kingdom participating in non-medical, short-term mission trips to Central and South America found that participants developed an increase in their ability to share their faith with others and a stronger sense of being close to God (Hopkins et al. 2015). A different study of North American youth who participated in short-term mission trips found that they were also more likely to become civically engaged in volunteer work and political activity (Beyerlein et al. 2011).

The durability of the increased non-organizational and intrinsic religiosity has been questioned by a study by Friesen (Friesen 2004, 5–11, 31–5); Friesen 2005). He surveyed participants of five Mennonite and Anabaptist missions. He found that at six months post-mission, the respondents reported an increase in personal communication with God, commitment to Christian community, evangelism, and using the Bible as a guide for life. However, by one year post-mission, these measures were back to or below the pre-mission trip baseline. Manitsas also found a lack of durability of the intrinsic religiosity changes of the missionaries he studied (Manitsas 2000, 43). By six months post-mission, there no longer was any significant increase in their feelings of being closer to God or more committed to Christian service. Their stated desire to participate in future missions still reached statistical significance.

The durability of the change in religiosity found in our study seems to exceed that found by Friesen and Manitsas. Our study showed statistically significant changes in religiosity after a mean time post-mission of 14.4 months. Whether these changes will be maintained further into the future would require further follow-up investigation.

Limitations to this study include the fact that the questionnaire was distributed to the medical missionaries after they completed the medical mission trips. Their answers to the questions about their attitudes and actions prior to going on the medical mission would therefore be retrospective in nature, which might decrease their accuracy. The response rate to the survey was 52 percent. It is possible that the missionaries who responded to the survey were not entirely representative of the missionary population as a whole. Some of the missionaries participated in two or more missions which may influence the results.

In regard to the durability of the change in religiosity of the mission participants, our survey was completed either seven months or nineteen months after the last mission attended. The distribution of respondents, seven months or nineteen months post mission, could not be ascertained due to the anonymity of the survey process. As such, the maintenance of the change in religiosity found in our survey could be either more or less than 14.4 months but is at least seven months. Finally, this paper reports on the effect on the religiosity of participants from two Catholic medical mission trips to Chiapas State in Mexico with Helping Hands Medical Missions in 2014 and 2015. Medical mission trips in different locations and with different organizations will doubtless provide different experiences. These results therefore may not be generalizable to other medical mission activities. Further research in other settings may be helpful in determining the generalizability of our findings.

CONCLUSION

We found that participation in short-term, medical mission trips to the San Cristobal de las Casas area of Mexico with Helping Hands Medical Missions was associated with an increase in non-organizational religious activity and intrinsic religiosity. The mission experience was also associated with the participants gaining a greater concern for health disparities and the burden of illness in the developing world. Experiencing a medical mission was associated with an increase in the missionaries' willingness to assist in further missionary activity abroad and in providing service and/or monetary assistance to impoverished people in their own community. They were more willing to discuss their faith with others. They also felt the mission trip made them better people and closer to God.

NOTE

- 1 Personal recollection of Erik Meidl, M.D., New London, MO; and email correspondence with the other missionary physicians, Dr. Stefan Holler, Oakland, CA; Dr. Deborah Baumann, Hannibal, MO; and Dr. John O'Brien, Syracuse, NY, December 2015.

ORCID

Katherine A. Meidl <http://orcid.org/0000-0002-3805-6400>

Erik J. Meidl <http://orcid.org/0000-0003-4416-1220>

REFERENCES

- Algothani, Nora, Yousef Algothani, and Bassel Atassi. 2012. Evaluation of a short-term medical mission to Syrian refugee camps in Turkey. *Avicenna Journal of Medicine* 2, no. 4: 84–8.
- Bartelme, Tony. 2015. Medical missions: do no harm?. *Physician Leadership Journal* 2, no. 2: 8–13.
- Berry, Nicole. 2014. Did we do good? NGOs, conflicts of interest and the evaluation of short-term medical missions in Solola, Guatemala. *Social Science and Medicine* 120: 344–51.
- Beyerlein, Kraig, Jenny Trinitapoli, and Gary Adler. 2011. The effect of religious short-term mission trips on youth civic engagement. *Journal for the Scientific Study of Religion* 50, no. 4: 780–95.
- Central Intelligence Agency. 2015. The World Factbook 2015: Mexico. Accessed January 23, 2016. <https://www.cia.gov/library/publications/resources/the-world-factbook/geos/mx.html>.
- Chen, A. T., A. Pedtke, J. K. Kobs, G. S. Edwards, R. R. Coughlin, and R. A. Gosselin. 2012. Volunteer orthopedic surgical trips in Nicaragua: A cost-effectiveness evaluation. *World Journal of Surgery* 36, no. 12: 2802–8.
- Chiu, Ya-Wen, Yi-Hao Weng, Chih-Fu Chen, Chun-Yuh Yang, and Ming-Liang Lee. 2012. A comparative study of Taiwan's short-term medical missions to the South Pacific and Central America. *BMC International Health and Human Rights* 12: 37–54.
- Chiu, Ya-Wen, Yi-Hao Weng, Chih-Fu Chen, Chun-Yuh Yang, and Ming-Liang Lee. 2014. Perceptions and efficiency of short-term medical aid missions among key groups of health professionals. *Health Services Research and Practice* 37, no. 3: 379–93.
- Cuéntame. n.d. Chiapas, Población, Diversidad. Accessed January 23, 2016. <http://cuentame.inegi.org.mx/monografias/informacion/chis/poblacion/diversidad.aspx?tema=me&c=07>.
- Davis, M. C., K. D. Than, and H. J. Garton. 2014. Cost effectiveness of a short-term pediatric neurosurgical brigade to Guatemala. *World Neurosurgery* 82, no. 6: 974–9.
- DeCamp, Matthew. 2011. Ethical review of global short-term medical volunteerism. *HEC Forum* 23: 91–103.
- Egle, Jonathan P., Alasdair McKendrick, Vijay K. Mittal, and Freddy Sosa. 2014. Short-term surgical mission to the Dominican Republic: A cost-benefit analysis. *International Journal of Surgery* 12: 1045–9.
- Explorando Mexico. n.d. Chiapas Geography. <http://explorandomexico.com/state/5/Chiapas/geography/> (23/01/16).
- Friesen, Randall Gary. 2004. Improving the long term impact of short-term missions: Based on the doctoral thesis, “The long-term impact of short-term missions on the beliefs, attitudes and behaviors of young adults.” University of South Africa, *MBMS International*. http://www.mbmision.org/files/staff/rfriesen/friesen_stm_the_sis_summary.pdf.
- Friesen, Randy. 2005. The long-term impact of short-term missions. *Evangelical Missions Quarterly* 41, no. 4: 449–54.
- Gloria Madrigal. 2015. e-mail message to author, December 28.
- Gravetter, F. J., and L. B. Wallnau. 2014. *Essentials of statistics for the behavioral sciences*. Belmont, CA: Wadsworth Cengage Learning.
- Green, Tyler, Heidi Green, Jean Scandlyn, and Andrew Kestler. 2009. Perceptions of short-term medical volunteer work: A qualitative study in Guatemala. *Globalization and Health* 5: 4–17.

- Hadjian, Avedis. 2013. The Gods of Chiapas: Mexican muslims in the shadow of Zapatistas. *International Business Times*, September 20. <http://www.ibtimes.com/gods-chiapas-mexican-muslims-shadow-zapatistas-1407812>.
- Hernandez, Guadalupe. 2014. The policy of primary healthcare in Mexico: State of Jalisco and Chiapas. https://blumcenter.ucla.edu/files/view/pdfs-of-student-research-2014/G._Hernandez.pdf.
- History.com. 2009. Chiapas. <http://www.history.com/topics/mexico/chiapas> (19/01/16).
- Holt, G. Richard. 2012. Ethical conduct of humanitarian medical missions: 1. Informed consent. *Archives of Facial Plastic Surgery* 14, no. 3: 215–7.
- Hopkins, Peter, Elizabeth Olson, Matt Baillie Smith, and Nina Laurie. 2015. Transitions to religious adulthood: Relational geographies of youth, religion and international volunteering. *Transactions of the Institute of British Geographers* 40, no. 3: 387–98.
- Isaacson, G., and A. Melaku. 2015. Results of pediatric tympanoplasty on short-term surgical missions. *The Laryngoscope* 126, no. 6: 1464–9.
- International Encyclopedia of the Social Sciences. 2008. Chiapas. <http://www.encyclopedia.com/topic/Chiapas.aspx> (26/03/16).
- Jamieson, S. 2004. Likert scales: how to (Ab)use them. *Medical Education* 38, no. 5: 1217–8.
- Kirby, Scott Harrison. 1995. Short-term volunteer foreign mission experiences: What difference do they make in the lives of the participants? PhD diss., Southeastern Baptist Theological Seminary.
- Koenig, Harold G., and Arndt Bussing. 2010. The Duke University Religion Index (DUREL): a five-item measure for use in epidemiological studies. *Religions* 1: 78–85.
- Koenig, Harold G., K. G. Meador, and G. Pakerson. 1997. Religion index for psychiatric research. *American Journal of Psychiatry* 154: 885–6.
- Lund Research Limited. 2013a. Wilcoxon signed-rank test using SPSS statistics. In *Laerd Statistics*. Derby, United Kingdom: Lund Research Limited. <https://statistics.laerd.com/spss-tutorials/wilcoxon-signed-rank-test-using-spss-statistics.php>.
- Lund Research Limited. 2013b. Sign test using SPSS Statistics. In *Laerd Statistics*. Derby, United Kingdom: Lund Research Limited. <https://statistics.laerd.com/spss-tutorials/sign-test-using-spss-statistics.php>.
- Maki, Jessi, Munirih Qualls, Benjamin White, Sharon Kleeffeld, and Robert Crone. 2008. Health impact assessment and short-term medical missions: A methods study to evaluate quality of care. *BMC Health Services Research* 8: 121–9.
- Manitsas, David L. 2000. Short term mission trips: A vehicle for developing personal and spiritual well-being. PhD diss., George Fox University.
- Merrill, Tim L., and Ramon Miro. 1997. *Mexico: A country study*. 4th ed. Washington, DC: Federal Research Division.
- Naujokas, Agne. 2013. Raising the quality of care during medical missions: A survey to assess the need for clinical and anatomic pathology services in international medical missions. *Archives of Pathology and Laboratory Medicine* 137: 637–41.
- Ott, Barbara B., and Robert M. Olson. 2011. Ethical issues of medical missions: The clinician's view. *HEC Forum* 23: 105–13.
- Parker, Edward. 2004. *Countries of the world: Mexico*. New York: Facts on File, Inc.
- Partners in Health. 2015. PIH Mexico expands to two new sites in Chiapas. Accessed April 1, 2016. <http://www.pih.org/blog/pih-mexico-expands-to-two-new-sites-in-chiapas>.
- Peterson, Roger P., and Timothy D. Peterson. 1991. *Is short-term mission really worth the time and money: Advancing God's kingdom through short-term mission*. Minneapolis, MN: STEM Ministries.
- Preston, Julia, and Samuel Dillon. 2004. *Opening Mexico: The making of a democracy*. New York: Farrar, Straus, and Giroux.
- Sanchez, J. F., E. S. Halsey, A. M. Bayer, M. Beltran, H. R. Razuri, D. E. Velasquez, V. E. Cama, P. C. Graf, A. M. Quispe, R. C. Maves, J. M. Montgomery, J. W. Sanders, and A. G. Lecano. 2015. Needs, acceptability, and value of humanitarian medical assistance in remote Peruvian Amazon riverine communities. *American Journal of Tropical Medicine and Hygiene* 92, no. 6: 1090–9.
- Secretaria de Economia. 2016. Promexico trade and investment, Chiapas. Accessed January 19, 2016. http://mim.promexico.gob.mx/Documentos/PDF/mim/FE_CHIAPAS_vfi.pdf (19/01/16).

- Sipaz: International Service for Peace. 2012. SI4-health: Chiapas-facts about Chiapas. Accessed January 19, 2016. <http://www.sipaz.org/en/chiapas/facts-about-chiapas/403-ds-4-salud.html>.
- Standish, Peter. 2009. *The states of Mexico: A reference guide to history and culture*. Westport, CT: Greenwood Press.
- Stone, Geren S., and Kristian R. Olson. 2016. The ethics of medical volunteerism. *Medical Clinics of North America* 100: 237–46.
- Sullivan, G., and A. R. Artino. 2013. Analyzing and interpreting data from likert-type scales. *Journal of Graduate Medical Education* 5, no. 4: 541–2.
- Sykes, K. J., P. T. Le, K. A. Sale, and P. J. Nicklaus. 2012. A 7-year review of the safety of tonsillectomy during short-term medical mission trips. *Otolaryngology Head Neck Surgery* 146, no. 5: 752–6.
- Tadisina, K. K., K. Chopra, J. Tangredi, J. G. Thomson, and D. P. Singh. 2014. Helping hands: A cost-effectiveness study of a humanitarian hand surgery mission. *Plastic Surgery International* 2014: 921625. <http://dx.doi.org/10.1155/2014/921625>.
- Tuttle, Kathryn A. 1998. The effects of short-term missions experiences on college students' spiritual growth and maturity. PhD diss., Talbot School of Theology, Biola University.
- United States Department of State: Bureau of Democracy, Human Rights, and Labor. 2005. Mexico: International religious freedom report 2005. Accessed January 20, 2016. <http://www.state.gov/j/drl/rls/irf/2005/51646.htm>.
- United States Department of State, Bureau of Democracy, Human Rights, and Labor. 2006. Mexico: International religious freedom report 2006. Accessed January 20, 2016. <http://www.state.gov/j/drl/rls/irf/2006/71467.htm>.
- Ver Beek, Kurt Alan. 2007. Lessons from the sapling: Review of quantitative research on short-term missions. PhD diss., Southeastern Baptist Theological Seminary.
- Voice of America. 2009. Chiapas, Mexico offers ancient, modern religion mix. Accessed January 20, 2016. <http://www.voanews.com/content/a-13-2009-08-03-voa12-68756032/410431.html>.
- Weng, Yi-Hao, Hung-Yi Chiou, Chi-Cheng Tu, Say-Tsung Liao, Patience Thulile Bhembe, Chun-Yuh Yang, and Ya-Wen Chiu. 2015. Survey of patient perceptions towards short-term mobile medical aid for those living in a medically underserved area of Swaziland. *BMC Health Services Research* 15: 524–32.
- Wilson, Dean Edward. 1999. The influence of short-term mission experience on faith and maturity. PhD diss., Asbury Theological Seminary.
- World Medical Association. 2016. World Medical Association declaration of Helsinki: Ethical principles for medical research involving human subjects. Adopted by the 18th WMA Assembly, Helsinki, Finland, June 1964 and amended 1975, 1983, 1989, 1996, 2000, 2002, 2004, 2008, 2013. <http://www.wma.net/en/30publications/10policies/b3/>.

BIOGRAPHICAL NOTE

Katherine A. Meidl is a first year medical student at the University of Missouri School of Medicine. She graduated with bachelor of science degrees in Biology and Psychology from the University of Missouri-Columbia in May 2016.

Joseph M. Meidl is an undergraduate student at Creighton University in Omaha, Nebraska. He is interested in studying political science.

Laura R. Meidl is a fourth year medical student at the University of Missouri-Kansas City School of Medicine.

Erik J. Meidl, M.D., F.A.C.P., is a practicing internist and president of the Hannibal Clinic, Hannibal, Missouri. He received a bachelor of arts from Dartmouth College, Hanover, New Hampshire and a medical degree from the University of Pennsylvania, Philadelphia, Pennsylvania. He has a certificate in medical ethics from The National Catholic Bioethics Center, Philadelphia, Pennsylvania. He may be contacted at emeidl@rallstech.com.