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Forecasting the Demand for Medical Tourism in India

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Abstract: *The purpose of this study is to predict as precisely as possible the medical tourism demand in India. As tourist arrivals is the most frequently used measure of tourism demand, the present study considers FTAs and their purpose of visit to India as a measure of inbound tourist to seek medical care. The medical tourism demand and its potential market till 2015 are identified based on available appropriate model as suited to the nature of data specific to individual country.*
Keywords: *Forecast, Opportunity, Medical Tourist, Tourist Arrivals.*

I. Introduction

An amalgamation of two distinct service sector 'healthcare' and 'tourism' with niche service features, medical tourism industry is one of the fastest growing service sectors of 21st century. The sector is growing exponentially and has emerged as a major force for the growth of service exports worldwide. With the availability of high quality healthcare services at affordable rate; increased role of information and communication channels; wider range of healthcare services from traditional to modern one, India is one of the major players in this multi-billion industry. In fact India's effort to promote medical tourism took off in the late 2002 after the Mckinsey – CII (2002) outlined immense potential of this sector. The following efforts were made:

- to modernize and expand airports in the country and to improve road connectivity and other infrastructural facilities,
- to promote many hospitals as centre of excellence in its tourism brochure,
- to ease the medical tourist arrivals 'M' and 'MX' visa is introduced,
- to avail tax concessions, medical tourism is declared as service sector,
- National Accreditation Board for Hospitals established to promote quality care of healthcare institutions,
- at the state level Kerala, Karnataka, Maharashtra and Gujarat have made many concerned efforts to promote healthcare tourism

As a result of such measures, the total FTAs in India of 6.57 million, 2.6 % were for medical treatments in 2012. Its foreign exchange earnings from medical tourism are estimated to be around US $ 1.8 billion in 2010 (Shanmugam, 2013) [1]. In fact Medical Tourism Climate Survey Report 2014 conducted by IMTEC states that India is second largest country after Thailand in accommodating foreign patients (IMTJ, 2014) [2]. Since 2000's the number of such travellers has been increasing by at least 25% every year. This situation shows that medical tourism in India is passing through a process of dynamic change. The market has been growing rapidly and is playing an increasingly important role in international tourism trade and trade relations. The forecasting of tourism demand and mapping of the potential market is therefore an essential prerequisite for planners and decision – makers that aims at cost efficient investments in the planning of capacity expansion and long term decision making related to investments (Huang, 2012) [3]. In lieu of this the present study will try to project the number of medical tourist arrivals from various country of nationality till 2015 as precisely as possible based on available models as suited to the nature of data specific to individual country. Since the data on the number of medical tourist arrivals and their country of nationality is not readily available, this report will significantly help decision makers for long term decision making for sustainability of medical tourism industry in India.

II. Database and Methodology

Tourism demand is usually regarded as a measure of visitors' use of goods or services. The objective of tourism demand forecasting is to predict the most probable level of demand that is likely to occur in the light of known circumstances. Among many measures including variety of units like national currency, nights, days, distances travelled, passengers seats occupied and accommodation facility used, tourist arrivals is the most frequently used measure of tourism demand (Fretchling, 2001) [4]. The present study considers Foreign Tourist Arrivals (FTAs) and their purpose of visit as a measure inbound medical tourism demand forecasting for India.

The number of quarterly and annual FTAs from different countries to India cover the period of first quarter of 2003 to last quarter of 2012 were used to predict total tourism demand up to 2015 as precisely as possible based on available appropriate models as suited to the nature of data specific to individual country. Quarterly FTAs data are provided by Ministry of Tourism, Government of India [i]. Time Series Modeler of IBM - SPSS 19.0 is used to build best – fit time series model to individual country covers following steps:

2.1. Building Models

The Time Series Modeler procedure creates models for time – series and produces forecast. It works on an assumption that a model of the series that explained the past values may also predict whether and how much the next few values will increase or decrease. It includes an Expert Modeler that automatically determines the best model for each of your time series, thus eliminating the need to identify an appropriate model through trial and error. Table 1 shows various best – fit models chosen by Expert Modeler for individual countries.

Table 1 Model Description

Model	Country of Nationality	Model Type
Exponential Smoothing	Argentina	Winters' Multiplicative
	Brazil	Winters' Multiplicative
	Austria	Winters' Multiplicative
	Denmark	Winters' Multiplicative
	Finland	Winters' Multiplicative
	Germany	Winters' Multiplicative
	Ireland	Winters' Multiplicative
	Norway	Winters' Multiplicative
	Portugal	Winters' Multiplicative
	Sweden	Winters' Multiplicative
	Switzerland	Winters' Multiplicative
	UK	Winters' Multiplicative
	Kazakhstan	Winters' Multiplicative
	Poland	Winters' Multiplicative
	Ukraine	Winters' Multiplicative
	Egypt	Winters' Multiplicative
	Kenya	Winters' Multiplicative
	South Africa	Winters' Multiplicative
	Israel	Winters' Multiplicative
	Myanmar	Winters' Multiplicative
	Australia	Winters' Multiplicative
	New Zealand	Winters' Multiplicative
	Canada	Winters' Additive
	USA	Winters' Additive
	Mexico	Winters' Additive
	Belgium	Winters' Additive
	France	Winters' Additive
	Greece	Winters' Additive
	Netherlands	Winters' Additive
	Russian Fed.	Winters' Additive
	Sudan	Winters' Additive
Exponential Smoothing	Tanzania	Winters' Additive
	Bahrain	Winters' Additive
	Iraq	Winters' Additive
	Oman	Winters' Additive
	Saudi Arabia	Winters' Additive
	Turkey	Winters' Additive
	Nepal	Winters' Additive
	Sri Lanka	Winters' Additive
	Bhutan	Winters' Additive
	Indonesia	Winters' Additive
	Malaysia	Winters' Additive
	Philippines	Winters' Additive
	Singapore	Winters' Additive
	Vietnam	Winters' Additive
	China (M)	Winters' Additive
	Japan	Winters' Additive
	Rep. of Korea	Winters' Additive
	Others	Winters' Additive

	Italy	Simple Seasonal
	Spain	Simple Seasonal
	UAE	Simple Seasonal
	Iran	Simple Seasonal
	Pakistan	Simple Seasonal
	China (Taiwan)	Simple Seasonal
ARIMA (p, d, q) (P, D, Q)s	Bangladesh	ARIMA(2,0,0)(0,0,0)
	Nigeria	ARIMA(0,1,0)(1,1,0)
	Yemen	ARIMA(0,1,0)(1,1,0)
	Afghanistan	ARIMA(0,0,1)(0,1,0)
	Maldives	ARIMA(0,0,1)(0,1,0)
	Thailand	ARIMA(0,0,0)(0,1,0)
	Czech Republic	ARIMA(0,0,0)(0,1,0)

2.2 Modeling Method and Assumption

For automatic time series forecasting of FTAs in India, the default method of Expert Modeler is chosen. By default, the Expert Modeler considers both exponential smoothing and ARIMA models of forecasting.

2.2.1 Exponential Smoothing

ES methods are classified as seasonal or non – seasonal. It summarizes each value of a time series with an average of recent values. It can be also defined as a weighted moving average with weights that decline exponentially into the past. The main difference among the various exponential smoothing methods is the way they treat the trend and seasonality (Cuhadar, 2014) [6]. Default Expert Modeler selects Winters' Multiplicative, Additive and Simple Seasonal Exponential Smoothing method for given countries as shown in Table 1. Winters' Multiplicative model is appropriate for series with a linear trend and a seasonal effect that depends on the level of the series. Its smoothing parameters are level, trend and season.

The basic equations for Winters' multiplicative method often known as Holt-Winters Multiplicative Method can be defined as follows:

Level: $L_t = d\frac{A_t}{S_{t-1}} + (1-a)(L_{t-1} + b_{t-1})$

Trend: $b_t = \beta(L_t - L_{t-1}) + (1-\beta)b_{t-1}$

Seasonal: $S_t = \gamma\frac{A_t}{L_t} + (1+\gamma)S_{t-s+h}$

Forecast: $F_{t+h} = (L_t + hb_t)S_{t-s+h}$

Winters' Additive model is appropriate for series with a linear trend and a seasonal effect that does not depend on the level of the series. Its smoothing parameters are level, trend and season. The equation for Winters' Additive method is as follows:

Level: $L_t = \alpha(A_t - S_{t-1}) + (1-\alpha)(L_{t-1} + b_{t-1})$

Trend: $b_t = \beta(L_t - L_t) + (1-\beta)b_{t-1}$

Seasonal: $S_t = \gamma(A_t - L_t) + (1-\gamma)S_{t-s}$

Forecast: $F_{(t+h)} = (L_t + S_{t-s+h})$

Simple Seasonal model is appropriate for series with no trend and a seasonal effect that is constant over time. Its smoothing parameters are level and season. It can be described by the following equations:

Level: $L_t = \alpha(A_t - S_{t-s}) + (1-\alpha)(L_{t-1})$

Seasonal: $S_t = \gamma(A_t - L_t) + (1-\gamma)S_{t-s}$

Forecast: $F_{(t+h)} = (L_t + S_{t-s+h})$

Where, L = level of the series
α = level smoothing constant between 0 and 1
A = actual values
s = number of seasonal periods in a year (as four quarters here)
b = trend of the series
β = seasonal smoothing constant between 0 and 1
S = seasonal component
γ = seasonal smoothing constant between 0 and 1
t = some time period
h = number of time periods ahead to be forecast

2.2.2 ARIMA Model

ARIMA model building method is an empirically driven methodology of systematically identifying, estimating, diagnosing and forecasting time series (Cuhadar, 2014) [7]. Popularly known as the Box – Jenkins approach this method searches for the combination of two forecasting method and their parameters that minimize the error in simulating the past series. The two methods are Auto-regression (AR) and Moving Average (MA). The acronym ARIMA is used to identify the Autoregressive Integrated Moving Average Method (Fretchling, 2001) [8], where '*I'* indicate the '*integration index'* which is a number of times a series must be differenced to achieve stationarity. The general form of the ARIMA Model is written as the following formulas – *ARIMA (p, d, q) (P, D, Q)s* which indicates as follows:

- Autoregressive (*p*): the number of autoregressive orders in the model. Autoregressive orders specify which previous values from the series are used to predict current values. For example, an autoregressive order of 2 specifies that the value of the series two time periods in the past be used to predict the current value.
- Difference (*d*): specifies the order of differencing applied to the series before estimating models. Differencing is necessary when trends are present (series with trends are typically non-stationary and ARIMA modeling assumes stationarity) and is used to remove their effect. The order of differencing corresponds to the degree of series trend 1st order differencing accounts for linear trends, 2nd order accounting for quadratic trends and so on.
- Moving Average (*q*): the number of moving average orders in the model. Moving average orders specify how deviations from the series mean for previous values are used to predict current values. For example, moving average orders of 1 and 2 specify that deviations from the mean value of the series from each of the last two time periods be considered when predicting current values of the series.
- *P*: is the number of parameters in Autoregressive Seasonal Model
- *D*: the seasonal differencing degree
- *Q*: the number of parameters in moving average seasonal model and
- *s*: the period of seasonality

It can be written as: $[\emptyset_p(B)\Phi_{PS}(B^S)\nabla^d\nabla^{DS}X_t = \theta_q(B)\Theta_{QS}(B^s)_{at}]$

Where, X_t = the observed value at time point t (or transformed value)
$\emptyset_p(B)$= the AR or Autoregressive operator i.e. $[(1 - \emptyset_1B - \emptyset_2B^2 - \ldots - \emptyset_2B^p)]$
B = the backshift operator $[BX_t = X_{t-1}]$
$\Phi_{PS}(B^S)$ = the seasonal AR Model $[(1 - \Phi_1B^s - \Phi_2B^{2s} - \ldots - \Phi_PB^{PS})]$
B^S = the seasonal backshift operator $[B^SX_t = X_{t-s}]$
∇^d = the differencing operator $[\nabla^dX_t = (1 - B)^dX_t]$
∇^{DS} = the seasonal differencing operator $[\nabla^{DS}X_t = (1 - B^S)^DX_t]$
a_t = the random error at time point 't' $[a_t \sim N(0, \sigma^2a)]$
$\theta_q(B)$ = the moving average operator $[1 - \theta_1B - \theta_2B^2 - \ldots - \theta_1B^q]$ and
$\Theta_{QS}(B^s)$ = seasonal moving average operator $[(1 - \Theta_1(B^S) - \Theta_2B^{2S} - \ldots - \Theta_QB^{QS})]$

2.3 Forecast Accuracy Evaluation

Accuracy testing is the most important tourist demand forecast evaluation criterion. The accuracy of a forecasting model depends on how close the forecast values of F_t are to the actual value of A_t. The magnitude of the forecasting error allows the analyst to evaluate the performance of the forecasting procedures across time periods in the series. Among many measures of forecast accuracy, MAPE or Mean Absolute Percentage Error is

often used to test forecasting accuracy. It is the error magnitude measures compute percentage errors relative to the values in the historical series. It is independent of the units used and can therefore be used to compare series with different units. It can be expressed as –

$$\text{MAPE} = \frac{1}{n} * \left(\left| \frac{e_t}{A_t} \right| * 100 \right)$$

Where, n = number of periods
e = forecast error i.e. $[e = A_t - F_t]$
A = actual value of the variable being forecast
t = some time period
F = forecast value

As a rule, lower MAPE values are preferred to higher ones because they indicate a forecasting model is producing smaller percentage errors. Lewis (1982) has suggested the following interpretation of MAPE values (Fretchling, 2001) [9]:

- less than 10 per cent is highly accurate forecasting
- between 10 and 20 per cent is good forecasting
- between 20 and 50 per cent is reasonable forecasting
- greater than 50 per cent is inaccurate forecasting

However demand of tourism is an outcome of highly complex human behavior but Lewis's interpretation is often used to judge MAPE values (Çuhadar, 2014) [10]. Therefore, comment on reliability of forecasting accuracy is made on the basis of MAPE value following Lewis's interpretation.

2.4. Generating Tourist Forecast and Estimating Potential Medical Tourist Arrivals to India

The aforesaid forecasting models are applied and projected number of FTAs till 2015 is generated. Country – wise data on the proportion of FTAs for the medical treatment, compiled by the Ministry of Tourism through disembarkation cards which have the provision for recording the purpose of the visit for each foreign tourist is selected to estimate the number of medical tourists till 2015. It is believed that the proportion of FTAs for medical treatment recorded for 2012 if extrapolated for the year 2014 & 2015, would give an estimated number of tourists nationality wise who are visiting India to undergo various medical treatments.

III. Projecting Demand for Medical Tourism in India

The empirical results of applied forecasting models which depict the projected number of FTAs to India up to 2015 have been shown in Table 2. It is projected that in 2015, India will host largest number of foreign tourists from USA (1255959), UK (809262) and Bangladesh (475643) followed by Sri Lanka, Germany, France, Canada and so on as shown in Fig. 1.

To measure forecast accuracy MAPE, the most widely used method is applied following Lewis's interpretation. Fig. 2 depicts reliability level of each forecasting model applied to individual country. It is noticed that the MAPE varies from a minimum of 3.20 per cent to 26.88 per cent across all models. It depicts that most of the forecasting models applied fall under good category of forecasting with less than 20 per cent of forecasting error except Kazakhstan, Myanmar, Russia, Bhutan, UAE and Pakistan which are reasonable or acceptable with more than 20 per cent of error.

The observed and estimated number of tourist arrivals to India for medical treatment from different country of nationality since 2009 to 2015 is shown in Table 3. Numerically, it is noticed that among different nationals the medical tourist arrivals in India is led by third world countries include Bangladesh, Maldives, Afghanistan, Iraq, Nigeria together with Russia, Oman, Sri Lanka, UAE, USA and so on (Fig. 3)

The estimated value depicts that in 2015 India will host maximum number of medical tourist arrivals from Afghanistan (36973), Maldives (36657), and Bangladesh (36625) followed by Nigeria, Iraq, Russia, Oman, Sri Lanka and so on (Fig. 4 and Fig. 5).

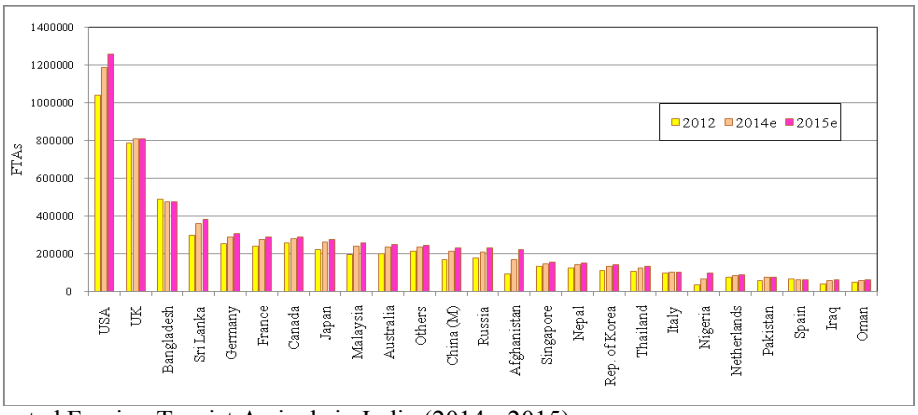

Figure 1 Estimated Foreign Tourist Arrivals in India (2014 - 2015)

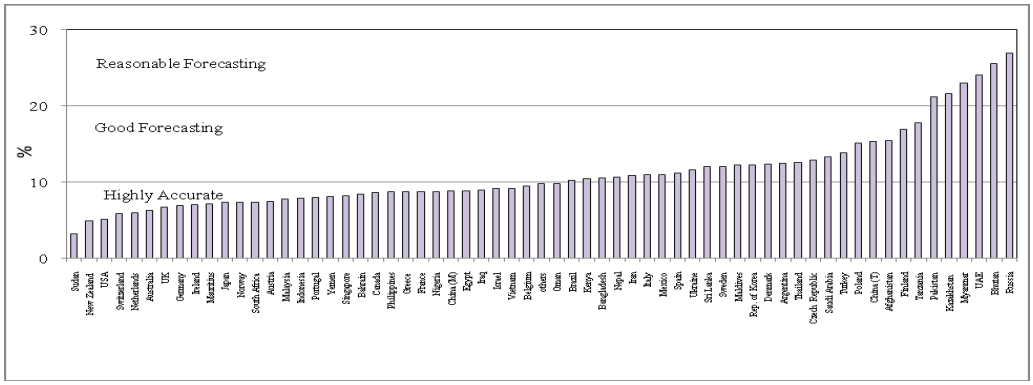

Figure 2 MAPE Plot – Testing Forecasting Accuracy (after Lewis, 1982)

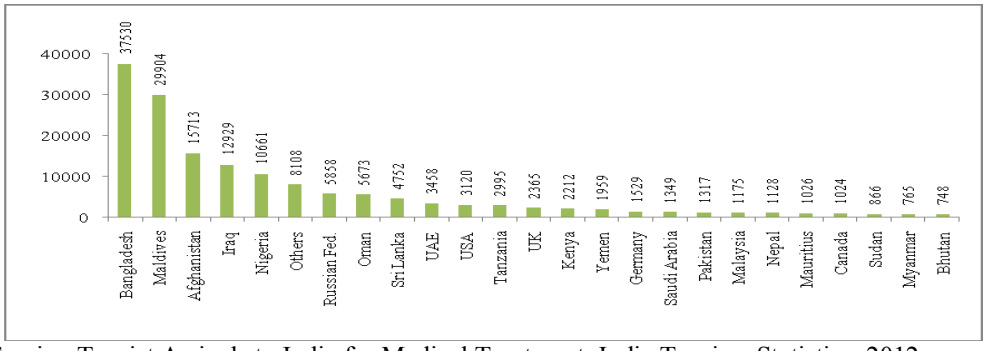

Figure 3 Foreign Tourist Arrivals to India for Medical Treatment, India Tourism Statistics, 2012.

IV. Conclusion

No doubt India has many advantages in health and medical tourism market varies from cost advantages, no waiting time, advanced medical infrastructure to the domain of holistic and traditional healthcare system. Many migrating patients in search of better opportunity of medical care have already chosen India as their destination for medical treatments. But observed number of medical tourist arrivals from different countries depicts that in spite of many healthcare advantages, India still accommodate large number of patients from third world nations including Bangladesh, Maldives, Afghanistan, Iraq and Nigeria followed by others (Fig. 5) and the trend being estimated to be same for 2015. However there is an opportunity of hosting maximum number of foreign tourists from USA, UK, Germany, France, and Canada where demand of outbound medical tourism is very high because of high cost of treatment to long waiting list (Mishra, 2012) [11] but still in order to explore the untapped potential of these developed nations' market India has to make some effective measures on the status of community health and hygiene and need based infrastructure especially in terms of connectivity, safety and security for the visitor travelling in the country.

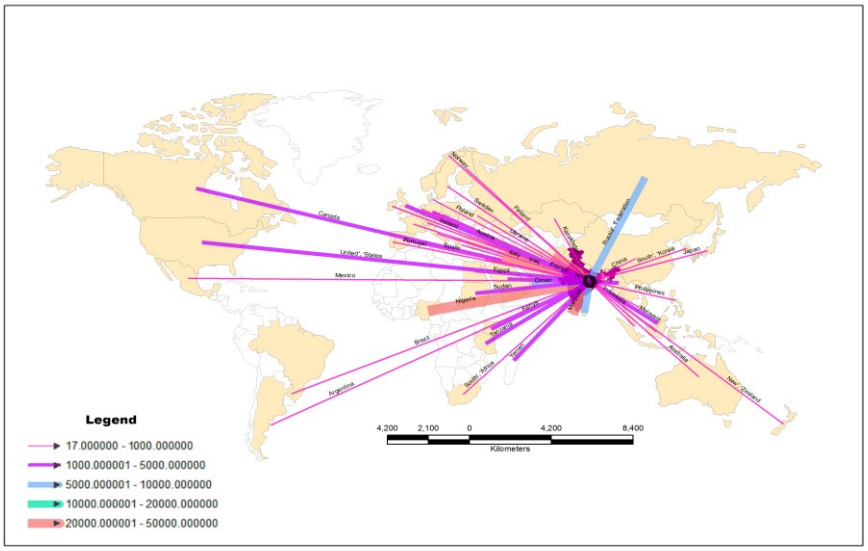

Figure 4 Mapping the Potential Market of Medical Tourism, 2015

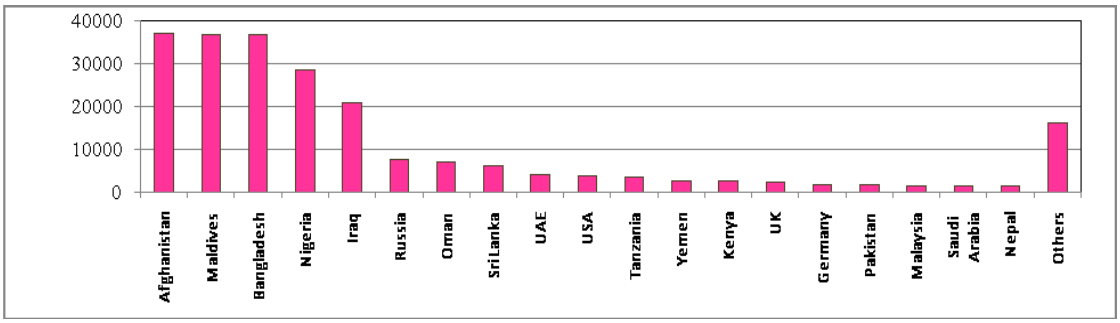

Figure 5 Projected Medical Tourist Arrivals to India, 2015

Table 2 Projected Foreign Tourist Arrivals to India (2013 - 2014)

Country of Nationality	Forecast	
	2014	2015
Argentina	10001	10974
Brazil	21319	22626
Austria	41324	43328
Denmark	33866	33479
Finland	25939	27247
Germany	289126	307891
Ireland	28491	30227
Norway	27303	29064
Portugal	28299	30056
Sweden	57169	60602
Switzerland	54321	56639
UK	808093	809262
Kazakhstan	13887	15120
Poland	27038	26883
Ukraine	39627	42830
Egypt	12787	13515
Kenya	38385	40116
South Africa	52522	55285
Israel	47384	48645
Myanmar	36723	40127
Australia	233815	249114
New Zealand	44999	47863
Canada	279401	287678

USA	1187861	1255959
Mexico	13498	14375
Belgium	48057	50627
France	276390	291030
Greece	8524	8971
Netherlands	83430	86997
Russia	209667	229572
Sudan	11780	12884
Tanzania	24061	25486
Bahrain	11306	11993
Iraq	57005	62308
Oman	58082	62178
Saudi Arabia	34557	36684
Turkey	25899	27586
Nepal	144212	152335
Sri Lanka	358921	382265
Bhutan	17503	18678
Indonesia	35788	38278
Malaysia	241767	256879
Philippines	42867	47537
Singapore	146180	154711
Vietnam	15479	17416
China (Main)	214799	230814
Japan	261912	275827
Rep. of Korea	135536	143505
Others	233745	245322
Italy	103767	103767
Spain	62985	62985
UAE	49143	49143
Iran	38745	38745
Pakistan	73900	73900
China (Taiwan)	36314	36314
Bangladesh	475863	475643
Nigeria	66137	97940
Yemen	23825	26463
Afghanistan	170209	224077
Maldives	58230	61816
Thailand	122588	131311
Czech Republic	12832	13683

Table 3 Medical Tourist Arrivals in India, 2009 - 2015

Country of Nationality	Observed MTAs in India				Estimated MTAs in India		
	2009	2010	2011	2012	2013	2014	2015
Argentina	6	8	9	39	36	40	44
Brazil	14	30	35	37	40	43	45
Austria	112	196	292	386	393	413	433
Denmark	62	71	104	132	137	135	134
Finland	25	24	24	45	49	52	54
Germany	766	1139	1201	1529	1622	1735	1847
Ireland	58	20	22	49	54	57	60
Norway	66	111	172	118	128	137	145
Portugal	52	63	72	99	106	113	120
Sweden	87	135	146	255	269	286	303
Switzerland	153	216	417	532	572	598	623
UK	1539	1519	1596	2365	2421	2424	2428
Kazakhstan	89	88	402	594	645	708	771
Poland	20	51	28	100	109	108	108
Ukraine	37	148	305	494	619	674	728
Egypt	41	40	62	53	60	64	68
Kenya	795	1257	1322	2212	2383	2495	2608
South Africa	222	167	292	502	498	525	553
Israel	81	87	48	95	92	95	97
Myanmar	218	412	977	765	833	918	1003
Australia	298	339	385	404	437	468	498
New Zealand	62	74	74	78	84	90	96
Canada	672	969	777	1024	1084	1118	1151
USA	2481	1863	1961	3120	3359	3564	3768
Mexico	8	21	11	34	38	40	43

Belgium	70	38	40	43	45	48	51
France	393	450	463	481	523	553	582
Greece	13	22	22	22	24	26	27
Netherlands	129	142	150	150	160	167	174
Russian Fed.	95	488	2598	5858	6262	6919	7576
Sudan	NA	401	715	866	961	1060	1160
Tanzania	NA	1870	2200	2995	3101	3296	3492
Bahrain	308	295	479	583	616	656	696
Iraq	NA	6773	8996	12929	17217	18983	20749
Oman	4913	5820	5559	5673	6154	6621	7088
Saudi Arabia	622	756	1366	1349	1362	1451	1541
Turkey	21	15	35	46	48	52	55
Nepal	1687	1357	11913	1128	1225	1298	1371
Sri Lanka	3840	5064	4894	4752	5369	5743	6116
Bhutan	227	771	1007	748	800	858	915
Indonesia	120	262	358	384	433	465	498
Malaysia	1083	1612	1457	1175	1360	1451	1541
Philippines	88	98	125	133	153	171	190
Singapore	381	645	595	657	688	731	774
Vietnam	6	7	10	11	14	15	17
China (Main)	100	120	142	169	199	215	231
Japan	125	168	194	220	248	262	276
Rep. of Korea	70	96	109	109	128	136	144
Others	3070	5196	4802	8108	1111	1169	1227
Italy	156	188	303	296	311	311	311
Spain	59	145	143	134	126	126	126
UAE	3731	3184	4912	3458	4079	4079	4079
Iran	208	296	304	287	271	271	271
Pakistan	850	466	778	1317	1626	1626	1626
China (Taiwan)	70	2	26	32	36	36	36
Bangladesh	27196	35853	34766	37530	36375	36641	36625
Nigeria	3264	6021	8988	10661	15538	19180	28403
Yemen	571	478	1032	1959	2200	2502	2779
Afghanistan	12057	5211	11201	15713	21333	28085	36973
Maldives	34254	36694	30563	29904	32403	34530	36657
Thailand	269	77	92	105	114	123	131
Czech Republic	0	20	34	56	60	64	68

Endnotes

[i] Data archived from India Tourism Statistics (2003 – 2012), published by Ministry of Tourism, Government of India.

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