Modeling of Total Cases due to COVID-19 and its Impact in India

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Received: 19 May 2020 / Accepted: 3 February 2021 / Published online: 16 February 2021
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Abstract This research paper focuses on the modeling of total cases due to COVID-19 and the critical assessment of socioeconomic impact on India. The data set considered for the present analysis is from December 31, 2019 to May 16, 2020 for training and testing of developed regression model. Least-square approximation of linear regression technique is applied to estimate the total cases of COVID-19. Three variables, viz. daily new cases, total deaths and daily new deaths, were considered for development of correlations. In the present study, seven correlations are developed as a function of single variable, two variables and three variables with accuracy (R^2) ranging from 85.71 to 99.95%. The paper also highlights the socioeconomic impact of COVID 19 on different sector, challenges and remedies for improving the GDP of the country.

Keywords Coronavirus · COVID-19 · Epidemics · Pandemics · Modeling · Socioeconomic impact

Abbreviations

%	Percentage
AD	Anno Domini
BC	Before Christ
GDP	Gross domestic products

IMF	International monetary fund
k	Numbers in thousands
MERs	Middle East respiratory syndrome
PHEIC	Public health emergency of international concern
R^2	Carl Pearson coefficient
SARs	Severe acute respiratory syndrome
WHO	World health organization
TDS	Tax deducted at source
TCS	Tax collected at source
MSMEs	Ministry of micro, small & medium enterprises
NBFs	Non-banking finance companies
HFCs	Housing finance companies
MFIs	Merchandise exports from India scheme
CLSS-MIG	Credit-linked subsidy scheme (CLSS) for middle-income groups (MIG)
KCC	Kisan Credit Card
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Act

Introduction

In nineteenth century, the coronavirus has been primarily associated with non-severe respiratory infections in human beings. Afterward, three different types of coronavirus have combined and widespread across the several countries [1–3]. At the beginning of the twentieth century, the severe acute respiratory syndrome (SAR) caused by coronavirus was diagnosed in China and spread in 29 countries with 8096 confirmed cases and 774 deaths [3–6]. In September 2012, the first case of Middle East respiratory syndrome

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Table 1 Chronological history of worse epidemics and pandemics [31]

Name of epidemic and pandemic	Year	No. of died	Place of origin/existence observed
COVID-19 Pandemic	2019–2020	3,07,146 died, 46,03,043 affected and 17,39,164 recovered in the world	China
ZIKA virus epidemic (spreads through mosquitos)	2015	–	South and Central America
West African EBOLA epidemic virus originated in bats	2014–2016	11,325 died and 28,600 affected	Republic of Sudan in 1976 and after in West Africa
H1N1 Swine flu	2009–2010	5,75,400 died and 1.4 Billion affected	Mexico
AIDS Pandemic (HIV virus that causes AIDS)	1981	Around 35 Million	West Africa
Asian flu (blend of avian flu)	1957–1958	1.1 Million in World and 1,16,000 in USA	China
Spanish flu (experienced during World War-I)	1918–1920	1/5th of 500 Million from North Poll	–
American polio epidemic (affect children)	1916	6,000 (27,000 cases reported)	New York City
Flu pandemic	1889–1890	1,00,000 (in 5 weeks)	Russia
Philadelphia yellow fever epidemic	1793	5,000	Philadelphia
Russian plague	1770–1772	1,00,000	Moscow
Great plague of Marseille	1720–1723	1,00,000 (30% Population of Marseille)	France
Great of plague of London	1665–1666	1,00,000 (15% Population of London)	London Europe
American plague	Sixteenth century	90% of western hemisphere	Europe and America
Cocoliztli epidemic	1545–1548	15 Million	Mexico and Central America
The black death	1346–1353	Half of Europe population	Travel from Asia to Europe
Plague of Justinian	541–542 AD	10% of total world	Byzantine Empire of Europe
Plague of Cyprian	250–271 AD	5000 (in a day)	Tunisia (Rome)
Antonine plague	165–180 AD	5,00,000	Rome
Plague of Athens	430 BC	1,00,000	Athens
Circa	3000 BC	–	China

(MERs) coronavirus was reported with 2458 confirmed cases and 848 deaths in 27 countries [7–10].

In December 2019, a new coronavirus was isolated in patients related to a fish market in the city of Wuhan, Hubei Province of China. This coronavirus named SARs-CoV-2 caused an epidemic in that city that has spread rapidly in the world, possibly the largest pandemic after the Spanish flu [11–13]. As the numbers of patients of pneumonia were increasingly tremendously in the Wuhan, the municipal health commission reported a cluster of cases of pneumonia while considering it as an epidemic healthcare issue which arises from pneumonia [14–16]. A novel coronavirus was eventually identified. Due to human-to-human transmission, the total cases of coronavirus in the world are around 4,621,409 on May 16, 2020 and more than 75% of total cases of the world shared by these countries with their percentage sharing as USA (32.12%), Spain (5.94%), Russia (5.69%), UK (5.12%), Italy (4.84%), Brazil (4.72%), France (3.88%), Germany (3.80%), Turkey (3.17%), Iran (2.52%), India (1.86%) and China (1.79%)

[16]. Total twenty worse epidemics and pandemics were studied under the critical assessment and enlisted in chronological order in Table 1.

WHO issued worldwide health emergency, indicating that SARs-CoV-2 is of urgent global concerned and estimated that reproduction factor (R_0) as 2.7. WHO time to time had performed its task during the critical situation and declared public health emergency of international concern (PHEIC) sixth time after the international health regulations came into existence in 2005. On January 30, 2020, WHO reported 7818 total confirmed cases worldwide with majority of these in China and 82 cases reported in 18 countries across the globe. Figure 1 illustrates the details of time-line plan of WHO's from December 31, 2019 to March 18, 2020. Presently, an international clinical trial is generating data from all medical organizations including WHO and researchers are collecting data on coronavirus throughout the world to find the most effective treatments for COVID-19 [16–18].

Fig. 1 WHO's time line of COVID-19 [16]

Numerous statistical techniques have gained momentum and are playing important role in the epidemiological data analysis. Statistical technique also can be used to develop standard mortality models like machine learning (ML) [19], artificial neural network (ANN) [20], probabilistic neural network (PNN) [21], Gaussian process for regression (GRNN) [22], auto-regressive integrated moving average (ARIMA) [23] and dynamic modeling [24]. WHO has given some guidelines and recommendations for handling of coronavirus patients. As per the recommendations, Equation A is used to calculate the active cases confirmed and affected by corona virus,

$$\text{ActiveCases} = \text{TotalCases} - \text{TotalDeaths} - \text{Recovered} \quad (1)$$

where total cases can be calculated as the addition of confirmed positive, presumptive and suspect or probable cases. Total deaths can be calculated as cumulative number

of deaths among detected cases. The recovered can be calculated as count of total patients discharged from hospitals, but here in recovered cases, some of the consequences were observed as imperfection in data submission from state to country level or local to national levels and vice versa. To calculate the recovered cases, the WHO recommends the following criteria of [symptoms resolve + 2 negative tests within 24 h] or [symptoms resolve + additional 14 days], but this is only recommendations [16]. In line with the relevant literature, the present work aimed to propose regression correlations for predicting total cases of COVID-19. The result of the study may facilitate the public health officials of the Indian government for prevention and control measures of COVID-19.

Fig. 2 Countries with their actual and projected GDP's [25, 26]

Fig. 3 Actual values of active cases and deaths due to COVID-19 [29]

Social Impact Due to COVID-19

The COVID-19 pandemic affected the educational systems such as schools, colleges and universities worldwide due to its widespread. According to the UNESCO report published on 25 March 2020, around 165 out of 195 countries of the world had closed educational systems due to COVID-19. Because of widespread of COVID-19, an individual with low income suffered mostly and die quickly. It has been observed that the COVID-19 spreads

very quickly in crowded residential, markets and workers in low skill jobs [3, 7, 8].

Economic Impact Due to COVID-19

WHO declared COVID-19 as a pandemic in January 2020, and it has spread in the worldwide as like wildfire. In the initial stage, most of the countries were taking COVID-19 as a cluster effect of pneumonia, but its adverse effect was

Table 2 Constants of Regression equation

Constant	Daily new cases	Total death's	Daily new death's	R ² value	Equation No
– 1062	17.554			95.42	3
109.8		30.5211		99.94	4
– 225			506.5	85.71	5
126.0	– 0.177	30.815		99.94	6
– 1035	20.48		– 92.7	95.64	7
152.5		31.179	– 12.68	99.95	8
122.0	30.564	0.584	– 19.54	99.95	9

observed in human-to-human transmission. Many of the countries have spent money on the development of medical infrastructures and medicines related to COVID-19. Due to pandemic adverse effect, all the countries across the globe suffered GDP loss. According to International Monetary Fund (IMF), world economic outlook report of April 2020, countries like USA, Germany, France, Italy and Spain had GDP loss ranging from – 5.9 to – 9.1%, whereas India and China have GDP loss ranging from 1.9 to 1.2%. As per the projection of financial year 2021, all the countries mentioned in Fig. 2 will be coming up in positive GDP [25, 26].

Socioeconomic Impact and Challenges

Understanding the turmoil effect of the economy is of paramount importance due to COVID 19. It is equally important to summarize the socioeconomic effect of various sectors that include primary sector (agriculture, petroleum and oil) basically involved in extraction of raw material, secondary sector (manufacturing industry), tertiary sectors (education, finance sector, health care and pharmaceutical, tourism, hospitality, aviation, real estate,

housing, sports, IT, media food, etc.) and other impacts are social impacts (family, society, etc.). Few of the challenges in front of Indian government are building of medical care facility at macro and micro-level, continuity in supply chain management in commodities, effective utilization of resources, sanitization in containment zone and other areas and issue associated with migrant workers.

On March 25, government invoked Disaster Mitigation Act 2005 and imposed national lockdown and extended it in phases, cancellation of flights at domestic and international level, suspension of train, bus and metro services, sealing of state borders, dedicated COVID-19 quarantine sites, extension of certain compliance deadlines, launching of other IT application like Aarogya Setu App. Recently, government of India has declared rupees 20 lakh crore relief package to boost different sectors such as small/medium enterprises including MSMEs, NBFs/HFCs/MFIs also reduced the TDS and TCS rates, free food grain supply to migrant workers for 2 months, special credit facility to street vendors, housing CLSS-MIG, additional credit through KCC, Agri-infrastructure fund, additional MGNREGS allocations, etc. The fund was allocated by government of India in five parts in between March 2020 to mid of the May 2020. The Economist Intelligence Unit has

Table 3 Percentile error observed in estimated values from actuals

Date	Actual	Estimated (predicted) total cases from regression correlations						
	Total cases [27]	3	4	5	6	7	8	9
2020-03-20	191	4.171	0.214	0.474	0.281	4.116	0.385	0.256
2020-03-30	1071	0.484	0.071	0.682	0.063	0.553	0.061	0.081
2020-04-01	1397	0.074	0.157	0.073	0.156	0.200	0.137	0.128
2020-04-10	6412	0.691	0.036	1.572	0.043	0.527	0.074	0.071
2020-04-20	17,265	0.517	0.034	0.043	0.039	0.589	0.037	0.020
2020-04-30	33,050	0.120	0.005	0.020	0.004	0.155	0.008	0.012
2020-05-01	35,043	0.032	0.002	0.049	0.002	0.058	0.002	0.004
2020-05-10	62,939	0.103	0.024	0.027	0.025	0.139	0.021	0.017
2020-05-16	85,940	0.201	0.021	0.396	0.020	0.177	0.015	0.016

Fig. 4 Comparison of actual and estimated values of total cases

forecasted the GDP growth rate for 2020–21 for India at 2.1% when compared to China and USA as 1% and –2.8% respectively [27, 28].

Results and Discussion

In this section, the results of statistical techniques applied in the present study are presented along with the interrelated recommendations for the improvement of GDP after COVID-19.

Numerical Modeling

Least-square approximation of linear regression technique has been utilized in the calculation of total cases of COVID-19 pandemic. The total cases can be calculated as a function of daily new cases, total deaths and daily new death's. Different regression equations are developed from the correlational analysis.

$$TotalCases_{Est.} = f(Dailynewcases, Totaldeaths, Dailynewdeaths) \quad (2)$$

For the analysis of COVID-19 statistical data of actual values of total cases, new cases, total deaths and new deaths are taken from WHO website from December 31, 2019 to May 16, 2020 [29]. Figure 3 illustrates the information of actual values of active cases and deaths due to COVID-19. To simplify the analysis, total deaths were measured in thousands and daily new deaths measured in numbers and dates were shown in step of ten days for simplicity. The total numbers of cases in India were less than 1100 up to March 30, 2020 and increased at an exponential rate after April 1, 2020 as shown in Fig. 3. Total cases are calculated by using seven different combinations; Carl Pearson coefficient (R^2) and constants

obtained from the regression analysis are depicted in Table 2. The R^2 value of the developed correlations is in the range of 85.71–95%. The correlations developed by using single, two and three variables under considerations are shown below:

$$TotalCases_{Est.} = -1062 + 17.554 * DailyNewCases \quad (3)$$

$$TotalCases_{Est.} = 109.8 + 30.5211 * TotalDeaths \quad (4)$$

$$TotalCases_{Est.} = -225 + 506.5 * DailyNewDeaths \quad (5)$$

$$TotalCases_{Est.} = 126 - 0.177 * DailyNewCases + 30.815 * TotalDeaths \quad (6)$$

$$TotalCases_{Est.} = -1035 + 20.48 * DailyNewCases - 92.7 * DailyNewDeaths \quad (7)$$

$$TotalCases_{Est.} = 152.5 + 31.179 * TotalDeaths - 12.68 * DailyNewDeaths \quad (8)$$

$$TotalCases_{Est.} = 122 + 30.564 * TotalDeaths + 0.584 * DailyNewCases - 19.54 * DailyNewDeaths \quad (9)$$

Table 3 illustrates the percentile error observed in estimated and actual values for the total cases. The highlighted cell shows the highest and the lowest percentile error given by the regressions correlations.

Figure 4 shows the estimated values obtained from the developed correlations compared with the actual total cases estimated by WHO's [25].

Minimum and maximum percentile observed in developed correlations ranges from 0.002 to 4.171. These correlations can also be useful for predicting data at macro-level (country and state) micro-level (district, cities, municipal corporation, villages, etc.). In the present study,

the data set under consideration is from December 31, 2019 to May 16, 2020. However, the developed correlations are applied for predicting the total cases for May 17, 2020 with the deviation of $\pm 3\%$.

Remedies for Improving GDP

Identifying the effective response strategies to fight against COVID-19 is very important. Eminent scientist, doctors and health officials are trying to identify preventive and treatment strategies to defeat COVID-19. Epidemiological modeling needs different approach as compare to engineering problem. The author believes that the present study will help the public health officials to handle COVID-19 problem which is unstable and open ended in nature. Principal of control theory involving feedback system can be applied to normalize the issue of COVID-19 with various approaches to manage trade-off between economy and health outcome. The International Monetary Fund (IMF) has cut the India's growth forecast for 2020–21 to 1.9% down from its earlier estimate of 5.8% in January this year. Also workers and members of lower income group have been hit hard as their wages disappeared. The International Labour Organization (ILO) estimates that 400 million peoples in India are at risk of sinking deeper into poverty [30]. There is a strong relationship between social, health, environment and economy. As India is trying to boost up its economy, exploring new resources of growth and identifying systematic actions are needed for sustainable economic growth. There are few interrelated recommendations to boost economy [31].

- Investment on cleaner production technologies.
- Application of virtual technology such as information communication technology (ICT) tools in all sectors.
- Online and digitization in various sectors.
- Relook and revamp to take into an account new drivers of growth in biotechnology and pharmaceuticals, renewable energy and organic farming.
- Expand excess to clean water and air.
- Application of fiscal mechanism.

- Promotion of self-sufficiency of economics in health, education, agriculture and communications.

Limitations

Limitations of our current work are as follows:

- Only linear relationship has been developed for the given data set.
- Present study is only applicable for Indian context.
- The study is limited to only short-term prediction.

Conclusions

COVID-19 has spread worldwide within a short span of time and affected a social and economic life of the human beings. WHO issued worldwide health emergency, indicating that SARS-CoV-2 is of urgent global concerned and estimated that reproduction factor (R_0) as 2.7. This research paper proposed a least-square approximation of linear regression technique for estimating the total cases of COVID-19 in India as a function of daily new cases, total deaths and daily new deaths. Seven correlations were developed to predict the total cases with the average accuracy of 96.65%. This kind of study is capable of providing a predictive solution to current and future pandemics and can be useful for public health officials for taking better decisions. Due to interrelationship between social, health, environment and economy, the country is vulnerable to economic downturn and needs greater access to new sources of growth that will improve life expectancy and economy. In the future, the study will be enhanced by adding variables like temperature and oxygen level of the patients.

Appendix

See Fig. 5.

See Table 4.

Fig. 5 Flow chart of modeling

Table 4 Estimation of total cases through regression analysis and calculation of absolute error

[illegible]

Table 4 continued

Actual Total cases	Estimation of total cases through regression analysis							Calculation of absolute error						
	3	4	5	6	7	8	9	3	4	5	6	7	8	9
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
3	−1062	110	−225	126	−1035	153	122	355.00	35.60	76.00	41.00	346.00	49.83	39.67
5	−1027	110	−225	126	−994	153	122	206.38	20.96	46.00	24.13	199.81	29.50	23.40
6	−1044	110	−225	126	−1015	153	122	175.07	17.30	38.50	19.97	170.09	24.42	19.33
28	−676	110	−225	122	−584	153	122	25.14	2.92	9.04	3.36	21.87	4.45	3.36
29	−1044	110	−225	126	−1015	153	122	37.02	2.79	8.76	3.34	35.98	4.26	3.21
31	−1027	110	−225	126	−994	153	122	34.13	2.54	8.26	3.05	33.07	3.92	2.94
34	−1009	110	−225	125	−974	153	122	30.69	2.23	7.62	2.69	29.63	3.49	2.59
44	−886	110	−225	124	−830	153	122	21.15	1.50	6.11	1.82	19.87	2.47	1.77
50	−957	110	−225	125	−912	153	122	20.13	1.20	5.50	1.50	19.24	2.05	1.44
73	−658	110	−225	122	−564	153	122	10.02	0.50	4.08	0.67	8.73	1.09	0.67
75	−1027	140	282	156	−1087	171	134	14.69	0.87	2.75	1.09	15.49	1.28	0.78
83	−922	171	282	186	−964	202	164	12.10	1.06	2.39	1.24	12.61	1.44	0.98
90	−939	171	−225	186	−892	215	183	11.43	0.90	3.50	1.07	10.91	1.39	1.03
93	−1009	171	−225	187	−974	215	183	11.85	0.84	3.42	1.01	11.47	1.31	0.97
125	−500	201	282	213	−472	233	195	5.00	0.61	1.25	0.70	4.78	0.87	0.56
137	−851	201	−225	216	−789	246	214	7.21	0.47	2.64	0.58	6.76	0.80	0.56
165	−570	201	−225	213	−462	246	214	4.46	0.22	2.36	0.29	3.80	0.49	0.30
191	−606	232	282	245	−595	264	225	4.17	0.21	0.47	0.28	4.12	0.38	0.18
231	−360	232	−225	242	−216	277	244	2.56	0.00	1.97	0.05	1.93	0.20	0.06
320	500	232	−225	234	788	277	244	0.56	0.28	1.70	0.27	1.46	0.13	0.24
439	1027	323	1295	321	1124	333	279	1.34	0.26	1.95	0.27	1.56	0.24	0.36
492	−132	384	788	394	−135	408	359	1.27	0.22	0.60	0.20	1.27	0.17	0.27
562	167	384	−225	391	399	433	397	0.70	0.32	1.40	0.30	0.29	0.23	0.29
649	465	507	1801	511	376	507	444	0.28	0.22	1.78	0.21	0.42	0.22	0.32
724	255	629	1801	637	130	631	566	0.65	0.13	1.49	0.12	0.82	0.13	0.22
873	1554	690	788	685	1831	719	665	0.78	0.21	0.10	0.22	1.10	0.18	0.24
979	799	873	2814	878	580	855	772	0.18	0.11	1.87	0.10	0.41	0.13	0.21
1071	553	995	1801	1003	478	1005	933	0.48	0.07	0.68	0.06	0.55	0.06	0.13
1251	2098	1086	1295	1080	2373	1112	1043	0.68	0.13	0.03	0.14	0.90	0.11	0.17
1397	1501	1178	1295	1179	1677	1205	1135	0.07	0.16	0.07	0.16	0.20	0.14	0.19

Table 4 continued

Actual Total cases	Estimation of total cases through regression analysis							Calculation of absolute error						
	3	4	5	6	7	8	9	3	4	5	6	7	8	9
1965	8909	1636	7373	1566	9207	1520	1366	3.53	0.17	2.75	0.20	3.69	0.23	0.30
2301	4836	1819	2814	1792	5290	1821	1720	1.10	0.21	0.22	0.22	1.30	0.21	0.25
2902	9488	2185	5853	2115	10,161	2119	1973	2.27	0.25	1.02	0.27	2.50	0.27	0.32
3374	7223	2460	4334	2415	7797	2438	2305	1.14	0.27	0.28	0.28	1.31	0.28	0.32
4067	11,103	3437	15,983	3362	10,191	3143	2847	1.73	0.16	2.93	0.17	1.51	0.23	0.30
4421	5152	3589	2308	3576	5751	3641	3512	0.17	0.19	0.48	0.19	0.30	0.18	0.21
5194	12,507	4657	17,503	4581	11,552	4351	4013	1.41	0.10	2.37	0.12	1.22	0.16	0.23
5734	8417	5176	8386	5146	8448	5109	4873	0.47	0.10	0.46	0.10	0.47	0.11	0.15
6412	10,840	6183	16,490	6138	9791	5935	5579	0.69	0.04	1.57	0.04	0.53	0.07	0.13
7447	17,106	7404	20,035	7308	16,454	7092	6669	1.30	0.01	1.69	0.02	1.21	0.05	0.10
8356	14,895	8442	16,996	8378	14,430	8228	7821	0.78	0.01	1.03	0.00	0.73	0.02	0.06
9152	12,911	9510	17,503	9476	12,023	9306	8872	0.41	0.04	0.91	0.04	0.31	0.02	0.03
10,363	20,196	10,456	15,477	10,358	20,893	10,322	9896	0.95	0.01	0.49	0.00	1.02	0.00	0.05
11,438	17,809	11,616	19,022	11,553	17,458	11,418	10,924	0.56	0.02	0.66	0.01	0.53	0.00	0.04
12,380	15,474	12,746	18,516	12,717	14,827	12,583	12,074	0.25	0.03	0.50	0.03	0.20	0.02	0.02
13,387	16,615	13,448	11,425	13,414	17,456	13,477	13,042	0.24	0.00	0.15	0.00	0.30	0.01	0.03
14,378	16,334	14,760	21,555	14,742	15,275	14,564	13,978	0.14	0.03	0.50	0.03	0.06	0.01	0.03
15,712	22,355	15,584	13,451	15,513	23,782	15,608	15,106	0.42	0.01	0.14	0.01	0.51	0.01	0.04
17,265	26,199	16,683	18,009	16,584	27,433	16,615	16,036	0.52	0.03	0.04	0.04	0.59	0.04	0.07
18,600	22,373	18,117	23,581	18,071	21,949	17,940	17,264	0.20	0.03	0.27	0.03	0.18	0.04	0.07
19,984	23,233	19,643	25,100	19,603	22,674	19,460	18,735	0.16	0.02	0.26	0.02	0.13	0.03	0.06
21,393	23,672	20,895	20,542	20,862	24,021	20,852	20,159	0.11	0.02	0.04	0.02	0.12	0.03	0.06
23,077	28,499	22,024	18,516	21,953	30,023	22,056	21,366	0.23	0.05	0.20	0.05	0.30	0.04	0.07
24,506	24,023	23,764	28,646	23,755	22,947	23,578	22,729	0.02	0.03	0.17	0.03	0.06	0.04	0.07
26,496	33,870	25,259	24,594	25,165	35,178	25,206	24,378	0.28	0.05	0.07	0.05	0.33	0.05	0.08
27,892	23,443	26,724	24,087	26,750	23,105	26,715	25,864	0.16	0.04	0.14	0.04	0.17	0.04	0.07
29,435	26,024	28,617	31,178	28,634	24,818	28,469	27,494	0.12	0.03	0.06	0.03	0.16	0.03	0.07
31,332	32,238	30,845	36,750	30,821	31,048	30,604	29,516	0.03	0.02	0.17	0.02	0.01	0.02	0.06
33,050	29,096	32,889	33,711	32,917	27,939	32,768	31,678	−0.12	0.00	0.02	0.00	0.15	0.01	0.04
35,043	33,923	35,118	36,750	35,118	33,015	34,966	33,795	−0.03	0.00	0.05	0.00	0.06	0.00	0.04
37,336	39,189	37,284	35,737	37,253	39,344	37,204	36,003	0.05	0.00	0.04	0.00	0.05	0.00	0.04
39,980	45,351	39,818	41,815	39,748	45,420	39,638	38,312	0.13	0.00	0.05	0.01	0.14	0.01	0.04
42,533	43,753	42,015	36,243	41,983	44,576	42,021	40,722	0.03	0.01	0.15	0.01	0.05	0.01	0.04
46,433	67,399	47,967	98,543	47,754	60,761	46,537	44,350	0.45	0.03	1.12	0.03	0.31	0.00	0.04
49,391	50,863	51,813	63,594	51,803	47,865	51,338	49,509	0.03	0.05	0.29	0.05	0.03	0.04	0.00
52,952	61,448	54,529	44,854	54,439	63,644	54,580	52,931	0.16	0.03	0.15	0.03	0.20	0.03	0.00
56,342	58,446	57,673	51,945	57,643	58,844	57,612	55,813	0.04	0.02	0.08	0.02	0.04	0.02	0.01
59,662	57,217	60,572	47,893	60,583	58,152	60,674	58,868	0.04	0.02	0.20	0.02	0.03	0.02	0.01
62,939	56,462	64,479	64,607	64,535	54,212	64,244	62,155	0.10	0.02	0.03	0.03	0.14	0.02	0.01
67,152	72,893	67,439	48,906	67,358	76,255	67,659	65,707	0.09	0.00	0.27	0.00	0.14	0.01	0.02
70,756	62,203	70,095	43,841	70,147	64,710	70,497	68,556	0.12	0.01	0.38	0.01	0.09	0.00	0.03
74,281	60,816	73,818	61,568	73,920	59,848	73,855	71,621	0.18	0.01	0.17	0.00	0.19	0.01	0.04
78,003	64,274	77,908	67,646	78,015	62,770	77,878	75,490	0.18	0.00	0.13	0.00	0.20	0.00	0.03
81,970	68,575	80,960	50,425	81,053	70,939	81,425	79,190	0.16	0.01	0.38	0.01	0.13	0.01	0.03
85,940	68,627	84,104	51,945	84,226	70,723	84,596	82,282	0.20	0.02	0.40	0.02	0.18	0.02	0.04

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