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Forensic Anthropology

# Age assessment by using facial photo-anthropometry in a Brazilian population

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### ABSTRACT

This study aimed to test the discriminant power of the photoanthropometric analysis of the human face for distinguishing females and males aged below or above 14 and 18. The sample consisted of 1354 photographs taken in frontal view of the Brazilian females and males aged between 10 and 22 years. Using SAFF-2D® software (Department of Federal Police, Brasília, Brazil), fourteen examiners positioned 35 landmarks in each of the photographs. The landmark positioning led to the quantification of 110 indices and 51 iridian ratios. These variables were tested into logistic regression models designed to distinguish females and males older or not than 14 and 18 years. Receiver Operating Characteristics (ROC) curves were used to assess the distinctive power of the models and the inherent Area Under the Curve (AUC) founded inferences about accuracy. The model was able to distinguish females that were not older than 14 in 129 cases (64.5%) and females that were older than 14 in 359 cases (75.42%). The females that were not older than 18 years were distinguished in 250 cases (60.83 %), while the females older than 18 years were distinguished in 199 cases (74.53%). Males that were not older than 14 were distinguished in 175 cases (84.95 %) and males that were older than 14 were distinguished in 381 cases (81.06 %). Males that were not older than 18 years were distinguished in 280 cases (68.97 %), while males older than 18 years were distinguished in 224 cases (83.58%). The female model reached 76% and 73% of distinctive accuracy for the thresholds of 14 and 18 years, respectively. The male model reached 90 % and 83 % for the same thresholds, respectively. Facial photoanthropometry is a useful tool for age estimation in criminal cases that involve the legal age thresholds of 14 and 18 years.

#### Introduction

Child pornography is a billionaire business and one of the fastest growing crimes in the black market worldwide [1]. Estimating the age of the victims through photographic or dynamic video materials, as well as classifying them into children and adolescents, is essential to support police investigations [2]. In many countries, such as Brazil, Hungary and Italy, the age threshold established for legal majority is 18 years [3]. While the threshold for the age of sexual consent is 14 [4]. Particularly, in Brazil, reports from SaferNet (new.safernet.org.br) – a dedicated non-governmental organization (NGO) – indicate that child and juvenile pornography is ranked top amongst the most common cybercrimes in the

country. According to the Federal Prosecution Service of Brazil, the leading position of this modality of crime persisted at least up to 2019. More specifically, in 2018, the National Centre for the Denunciation of Cybernetic Crimes registered nearly 60 thousand reports. Despite the fact this is possibly an underreported crime, the quantity of cases in that year represented an increase of nearly 80 %. From a criminal perspective, the national Law classify as pedo-pornography the acquisition, storage and distribution of any kind of material (static or dynamic). Penalties might extend up to eight years of reclusion (with possible aggravating circumstances).

Recommendations for the age estimation of the living from images and video footages are provided by the interdisciplinary Study Group on

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Forensic Age Diagnostics (SGFAD) [2]. However, there is no scientific protocol exclusively established to estimate age from photographs of the human face applicable to the thresholds of legal interest (e.g. 18 and 14 years). The photoanthropometric analysis of the human face emerged as an alternative tool for assessing facial traits and in association with age intervals [5]. This approach is founded on the positioning of anatomical landmarks in photographs and the calculation of ratios between anatomic structures. In general, the photoanthropometric analysis applied to age estimation does not describe in detail the morphological alterations of the human face over the time. For this reason it may not be an accurate tool for distinguishing age in short intervals [6]. However, it may be tested as a tool with dichotomic response to infer if a child is under or over the age of sexual consent or if an adolescent is younger or older than the age of legal majority.

This study tested the discriminant power of the photoanthropometry of the human face for distinguishing individuals younger or older than 14 and 18 years of age.

# Material and methods

This cross-sectional study was designed according to the Standards of the Scientific Group of Forensic Facial Identification (FACISGroup). The research protocol was approved by the local committee of ethics in human research (protocol: CAAE-51448515.0.3002.0075).

The sample consisted of 1354 photographs of the human face of Caucasian Brazilian individuals, with European ancestry, aged between 10 and 22 years homogeneously distributed based on sex (Table 1). The photographs were standardly taken in frontal view following the recommendations of the International Civil Aviation Organization (ICAO). The same model of camera, lenses and flash were used to take all the photographs. The distance between the lenses and the face of the participants was set in 150 mm. The obtained images had a pixels resolution of  $640 \times 480$  and were stored in. png 24-bit format. During the photographic acquisition, the participants had to express a neutral face, with closed lips and the head positioned towards the camera. Photographs that did not enable a complete visualization of the face due to hair position, eyeglasses, make-up and jewelry were excluded. Participants with evident facial asymmetries or deformations, as well those with misaligned face in the sagittal, axial and coronal planes, were also excluded.

Fourteen examiners were trained and calibrated for using a software specifically designed for landmark positioning (SAFF-2D<sup>®</sup>, Department of Federal Police, Brasília, Brazil). With the software 35 anatomic landmarks (23 bilateral and 12 in the median plane) were positioned [7] (Fig. 1, Table 2). The landmark positioning led to the quantification of 160 measurements (variables). The measurements led to the calculation of 110 indices (IND) [8] and 50 iridian ratios (IR) [5]. Comparisons of the

Tab	le 1	
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Age (years)	n	Frequency (%)
10-10.99	94	6.9
11-11.99	103	7.6
12-12.99	108	8.0
13-13.99	101	7.5
14-14.99	107	7.9
15-15.99	105	7.8
16-16.99	103	7.6
17-17.99	97	7.2
18-18.99	100	7.4
19–19.99	110	8.1
20-20.99	110	8.1
21-21.99	107	7.9
22-22.99	109	8.0
Total	1354	100.0

n: number of participants.

mean IND and IR between females and males were performed with Mann-Whitney test. In order to assess the influence of the 160 quantitative variables over the age (to distinguish participants aged below or above 14 and 18), a logistic regression model [9] was separately designed for females (F) and males (M), as well as for the general sample (F + M). Firstly, the model was adjusted with all the variables. Next it was investigated for multicolinearity. Variance Inflation Factor (VIF) [10] was applied. Variables with VIF above 10 were removed from the model. Backward approach [11] with a level of significance of 5% was used. Within this approach, the variables with higher p-value are sequentially removed and only those with p < 0.05 are maintained. The quality of the adjustment of the logistic regression was assessed with Hosmer-Lemeshow test [12] and R<sup>2</sup>. The Receiver Operating Characteristics curve (ROC) [13] was used to classify the positive (sensibility) and falsepositive (specificity) outcomes. Additionally, the area under the curve (AUC) was used to make inferences in accuracy. The statistical analysis was performed within R<sup>®</sup> 3.4.2. (The R Foundation, Vienna, Austria) software package.

Intra- and inter-examiner agreement for placing landmarks was quantified by repeating the landmarking procedure on 10 photographs, three times, within intervals of 15 days and in a double-blind set-up. Quantification was performed with Intraclass Correlation Coefficient (ICC).

## Results

Out of the total sample, 678 (50.07 %) were females and 676 (49.93 %) were males. The distribution of females and males based on age showed that 200 (29.5 %) females and 206 (30.47 %) males were under 14, while 411 (60.62 %) females and 407 (60.21 %) males were under 18 (Table 3).

A descriptive analysis of the variables showed that 41 IND and 2 RI were higher in females (p < 0.05), while 42 IND and 40 IR were higher in males (p < 0.05) (Table 4).

In females, the variables that had significant influence in age estimation were IND\_002, IND\_048, IND\_050, IND\_059, IND\_072, IND\_077, IND\_078, IND\_082, IND\_091, IND\_097, IND\_102, IR\_11 e IR\_23 for the age threshold of 14 years and IND\_048, IND\_050, IND\_059, IND\_078, IND\_082, IR\_11, IND\_029, IND\_058, IND\_073, IR\_01, IR\_22 for the age threshold of 18 years (Table 5). The following regression formula resulted from statistic modeling the data from females:

Females aged >14 years:

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$$\begin{split} & \gamma = 25,01-0,09 \times \textit{IND}_{002}) - 0,12 \times \textit{IND}_{048}) - 0,03 \times \textit{IND}_{050}) \\ & + 0,21 \times \textit{IND}_{059}) + 0,02 \times \textit{IND}_{072}) + 0,06 \times \textit{IND}_{077}) - 0,11 \\ & \times \textit{IND}_{078}) - 0,05 \times \textit{IND}_{082}) - 0,34 \times \textit{IND}_{091}) - 0,03 \times \textit{IND}_{097}) \\ & - 0,10 \times \textit{IND}_{102}) - 2,06 \times \textit{RI}_{11}) + 5,20 \times \textit{RI}_{23}) \end{split}$$

$$ProbAge > 14) = \frac{\exp(\gamma)}{1 + \exp(\gamma)}$$

Females aged >18 years:

$$\begin{aligned} \gamma &= 13,78 - 0,14 \times \text{IND}_{048} \right) - 0,04\text{IND}_{050} \right) + 0,22\text{IND}_{059} \right) \\ &- 0,16\text{IND}_{078} \right) + 0,03\text{IND}_{082} \right) - 3,32\text{RI}_{11} \right) + 0,07\text{IND}_{029} \right) \\ &- 0,03\text{IND}_{058} \right) - 0.09\text{IND}_{073} + 0,13\text{RI}_{01} \right) + 3.96(\text{RI}_{22}) \end{aligned}$$

$$ProbAge > 18) = rac{\exp(\gamma)}{1 + \exp(\gamma)}$$

The ROC outcomes showed that the model was able to distinguish the females that were not aged >14 in 129 cases (64.5 %) and the females that were aged >14 in 359 cases (75.42 %) (Fig. 2). The females that were not aged >18 years were distinguished in 250 cases (60.83 %), while the females aged >18 years were distinguished in 199 cases (74.53 %) (Fig. 3).



Fig. 1. Facial landmarks used in the present study. Legend: A description of the landmarks is provided in Table 2.

In males, the variables that had significant influence in age estimation were IND\_022, IND\_073, IND\_091, IND\_097, IR\_10, IR\_22, IR\_49 for the age threshold of 14 years and IR\_22, IND\_006, IND\_050, IND\_058, IND\_059, IND\_072, IND\_084, IND\_091, IR\_01, IR\_11, IR\_50 for the age threshold of 18 years (Table 6). The following regression formula resulted from statistic modeling the male data: Males aged >14 years:

 $\begin{array}{l} \gamma = -14,06-0,04\times IND_{022}) + 0,14\times IND_{073}) + 0,43\times IND_{091}) \\ - 0,11\times IND_{097}) + 5,92\times RI_{10}) + 8,62\times RI_{22}) - 0,48\times (RI_{49}) \end{array}$ 

$$ProbAge > 14) = \frac{\exp(\gamma)}{1 + \exp(\gamma)}$$

#### Table 2

Photoanthropometric landmarks used in the present study.

#	Landmark	Distribution	Code
1	Ectocanthion	bilateral	ec_d / ec_e
2	Endocanthion	bilateral	en_d / en_e
3	Iridion laterale	bilateral	il_d / il_e
4	Iridion mediale	bilateral	im_d / im_e
5	Upper palpebral groove	bilateral	sps_d / sps_e
6	Upper palpebra	bilateral	ps_d / ps_e
7	Lower palpebra	bilateral	pi_d / pi_e
8	Medial eyebrow	bilateral	sm_d / sm_e
9	Lateral eyebrow	bilateral	sl_d / sl_e
10	Frontotemporal	bilateral	ft_d / ft_e
11	Upper eyebrow	bilateral	ss_d / ss_e
12	Lower eyebrow	bilateral	si_d / si_e
13	Trichion	median	tr
14	Pronasale	median	prn
15	Subnasale	median	sn
16	Alare	bilateral	al_d / al_e
17	Upper nostril	bilateral	nas_d / nas_e
18	Lateral nostril	bilateral	nal_d / nal_e
19	Subalare	bilateral	sbal_d / sbal_d
20	Labiale superior	median	ls
21	Crista philtrum	bilateral	cph_d / cph_e
22	Chelion	bilateral	ch_d / ch_e
23	Stomion	median	sto
24	Labiale inferior	median	li
25	Labiomentale	median	lm
26	Gnathion	median	gn
27	Gonion	bilateral	go_d / go_e
28	Zygion	bilateral	zy_d / zy_e
29	Supra-auriculare	bilateral	sa_d / sa_e
30	Post-auriculare	bilateral	pa_d / pa_e
31	Subauriculare	bilateral	sba_d / sba_e
32	Supralobulare	bilateral	slb_d / slb_e
a1	Midnasale	median	mid
a2	Pupil	bilateral	pu_d / pu_e
a3	Glabela	median	g
a4	Nasion	median	n

Table 3Distribution of females and males based on the ages of 14 and 18.

Age Total			Sex				
					es	Males	
		n	%	n	%	N	%
>14	No	406	29.99 %	200	29.50 %	206	30.47 %
	Yes	948	70.01 %	478	70.50 %	470	69.53 %
> 18	No	818	60.41 %	411	60.62 %	407	60.21 %
	Yes	536	39.59 %	267	39.38 %	269	39.79 %

n: absolute frequency; %: relative frequency.

Males aged >18 years:

$$\begin{array}{l} \gamma = -31,82 + 6,70 \times \mathrm{RI}_{22}) + 0,13\mathrm{IND}_{006}) - 0,02 \times \mathrm{IND}_{050}) + 0,06 \\ \times \mathrm{IND}_{058}) + 0,12 \times \mathrm{IND}_{059}) + 0,02 \times \mathrm{IND}_{072}) + 0,07 \times \mathrm{IND}_{084}) \\ + 0,26 \times \mathrm{IND}_{091}) - 0,20 \times \mathrm{RI}_{01}) + 3,59 \times (\mathrm{RI}_{11}) - 2,39 \times (\mathrm{RI}_{50}) \end{array}$$

$$ProbAge > 18) = rac{\exp(\gamma)}{1 + \exp(\gamma)}$$

The ROC outcomes showed that the model was able to distinguish the males that were not aged >14 in 175 cases (84.95 %) and the males that were aged >14 in 381 cases (81.06 %) (Fig. 4). The males that were not aged >18 years were distinguished in 280 cases (68.97 %), while the males aged >18 years were distinguished in 224 cases (83.58 %) (Fig. 5).

Intra- and inter-examiner agreement outcomes were excellent (ICC > 0.9, p < 0.001).

# Discussion

The International Crime Police Organization (INTERPOL) describes the concept of child pornography as the visual representation of sexual exploitation with major focus in child sexual behavior and genitals including audio records and written material [14]. In Europe, critical thresholds of legal interest for child and juvenile pornography are mainly found in the ages of 14, 16 and 18. The European Union legislation (Council Framework Decision 2004/68/JHA) indicates the term "child pornography" may be used not only to describe the sexual exploitation of real minors, but also to described cases that involve pseudo-minority (i.g. adults simulating minors in sexual behavior) [2]. As many other countries, Brazil establishes as children those individuals aged below 14 years, while adolescents are those aged between 14 and 18 [15]. Criminal cases that involve children and adolescents with unknown or uncertain age require the participation of forensic experts and their knowledge to estimate the age [16]. In this context, this study aimed to test the discriminant power of the photoanthropometry of the human face as an age estimation tool to distinguish victims and/or perpetrators of sexual crimes based on the age thresholds of 14 and 18 years.

Despite the existing methods for the photoanthropometric study of facial growth in many fields of science, few approaches were adapted for forensic applications. Recently, authors from Europe showed that clinically-visible facial alterations related to age could be detected and studied for age estimation in photographs. More specifically, the authors quantified morphological facial alterations over the time into photoanthropometric indices strongly correlated with age [1]. Similarly, the current study investigated anthropometric indices obtained from landmark positioning in photographs. However, it is important to note that the quality of the photographs, the distance between the camera and the subject and the angulation of the camera may influence and hamper the photoanthropometric analysis [17]. For this reason, ICAO photographic protocol was followed in the present study. With a proper sample of images and a methodological set up designed according to the previous scientific literature, this study tested the discriminant power of photoanthropometry as a tool to distinguish subjects based on the legal age thresholds of 14 and 18 years.

The logistic regression model to distinguish females aged above 14 showed good adjustment (via Hosmer-Lemeshow test; p = 0.514). In this model, the variables were able to explain 22.88 % of the classification based on age (via Pseudo R<sup>2</sup>). The ROC curve cutoff was 0.66, which means that subjects are classified above 14 years when the estimated probability of the model reaches 0.66 or higher. The AUC showed an accuracy of 75 %, with sensitivity and specificity of 75 % and 65 %, respectively. Good adjustment was also observed within the logistic regression model to distinguish females aged above 18 (p = 0.494). In this model, the variables were able to explain 19.9 % of the classification based on age. The cutoff value of the ROC curve for this model was 0.35, while the accuracy was 73 % (AUC), with sensitivity of 75 % and specificity of 61 %.

In males, the logistic regression models to distinguish those aged above 14 also had a good adjustment (via Hosmer-Lemeshow test; p =0.289). In this case, the variables were able to explain 54.84 % of the classification based on age (Pseudo R<sup>2</sup>). The ROC curve cutoff was 0.71, while the accuracy was 90 % (AUC), with sensitivity of 81 % and specificity of 85 %. For distinguishing males aged above 18, the logistic regression model had a good adjustment (p = 0.122), in which the variables were able to explain 40.52 % (Pseudo R<sup>2</sup>) of the classification based on age. The ROC curve cutoff was 0.35, while the accuracy was 83 % (AUC), with sensitivity and specificity of 84 % and 69 %, respectively.

In comparison, the outcomes of the logistic model designed based on the threshold of 14 were more accurate than those based on the age

# Table 4

Mean and standard deviation of the indices (IND) and iridian ratios (IR) in females and males.

Image     Image     Image     Image       B0.061     B1.10     10.2     R2.33     7.11     7.967     15.61     0.000       B0.062     86.4     5.98     66.25     5.51     6.50     0.47     0.98       B0.066     7.989     4.57     4.50     4.53     0.000     1.80     0.63     0.66     0.67     0.77     3.18     0.63     0.63     0.63     0.63     0.63     0.63     0.63     0.63     0.63     0.63     0.63     0.63     0.63     0.63     0.63     0.63     0.63     0.63     0.63	Variables	Total		Sex			р	
Jama     50     Jama     50     Jama     Solution       Bill,001     81.10     1.02     62.13     7.11     7.42     1.16.1     0.000       Bill,001     65.66     7.39     64.65     7.11     7.42     62.71     0.000       Bill,001     65.67     4.52     65.64     4.11     54.52     6.64     0.000       Bill,006     7.90     4.77     7.77     4.77     8.004     6.13     0.000       Bill,006     7.90     4.78     7.76.4     4.77     8.004     6.13     0.000       Bill,010     1.148     4.26     7.22     6.23     7.19     4.04     0.000       Bill,0111     7.14     4.02     62.14     7.12     7.11     4.02     0.000       Bill,011     7.14     4.02     62.14     7.12     7.11     4.02     0.000       Bill,011     7.14     4.26     7.13     4.03     0.000     0.000     0.000     0.000     0.000     0.000     0				Female		Male		
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		Mean	SD	Mean	SD	Mean	SD	
NUD02     86.41     5.88     86.23     5.36     86.68     6.54     6.169       ND,054     65.67     4.80     5.41     4.10     45.54     4.47     6.003       ND,056     55.67     4.23     45.41     4.10     45.54     4.47     6.003       ND,057     7.99     4.42     6.956     7.18     7.43     1.20     6.000       ND,069     7.53     8.26     7.28     6.63     7.519     6.02     6.000       ND,011     5.16     4.23     5.06     6.27     6.03     1.717     4.50     6.000       ND,013     5.17     6.98     7.853     7.863     7.66     0.000       ND,014     5.377     6.98     7.853     4.78     3.549     8.63     0.318       ND,017     6.613     7.00     96.00     6.38     96.28     7.77     6.56       ND,017     6.62     5.60     7.60     6.38     96.28     1.031     6.000       ND,017	IND 001	81.10	10.92	82.33	7 11	79.87	13.61	0.000
NP.D0066.067.8064.457.1166.878.270.000DD,D0445.674.2055.404.1354.314.230.001DD,D0556.076.0054.074.2054.0154.314.230.001DD,D0671.994.2176.054.2230.466.130.000DD,D0675.738.2676.223.3351.714.250.036DD,01071.944.266.223.3351.714.150.000DD,01470.166.2737.374.013.67.37.900.000DD,01453.176.9852.854.783.408.630.310.000DD,01453.176.987.923.188.63.98.750.000DD,0146.977.137.746.1477.657.900.000DD,0146.977.016.386.42.91.16.70.000DD,0146.977.017.704.386.45.91.16.70.000DD,0150.977.137.704.384.68.94.750.000DD,0147.669.094.955.05.67.705.631.16.70.000DD,0150.977.137.707.374.384.68.94.570.000DD,0150.977.177.707.705.645.700.000.000DD,0150.977.177.707.705.64<	IND_002	86.41	5.98	86.23	5.36	86.58	6.54	0.189
DD,0056.076.0056.434.104.55.44.479.00DD,0075.006.0156.076.0156.076.016.020.02DD,0075.308.207.274.274.021.100.00DD,0075.338.207.286.6375.194.060.00DD,0175.348.206.517.2270.774.550.025DD,017.618.787.496.847.86.10.025DD,017.618.787.496.847.660.00DD,017.618.787.496.867.670.01DD,019.617.671.887.660.000.00DD,019.617.707.108.506.667.670.00DD,019.617.707.708.349.627.760.64DD,019.617.707.708.349.627.760.00DD,017.708.634.493.634.620.00DD,027.766.667.777.708.347.641.300.00DD,027.766.667.777.708.634.620.00DD,027.756.667.777.708.634.620.00DD,027.756.667.777.708.634.620.00DD,027.756.667.757.757.757.757.750.00	IND_003	65.66	7.80	64.45	7.11	66.87	8.27	0.000
bb.20655.076.6065.404.3154.338.4330.000bb.20673.004.7377.038.137.166.43bb.20674.365.374.3057.661.100.000bb.206975.738.267.286.3357.661.100.000bb.20117.084.262.263.3351.714.750.035bb.20117.088.267.284.067.8.20.0010.001bb.20117.088.274.087.8.21.0110.000bb.20127.086.667.0673.186.660.005bb.20150.036.667.0673.186.663.160.001bb.20160.0431.037.056.137.050.000bb.20170.131.107.051.017.050.000bb.20180.941.037.051.017.050.000bb.20170.131.107.051.017.050.000bb.20177.164.777.771.023.387.060.000bb.20177.164.777.771.024.381.140.000bb.20177.164.784.314.744.517.760.000bb.20177.164.784.314.744.744.744.744.744.744.744.744.744.744.744.744.744.744.74<	IND_004	45.47	4.28	45.41	4.10	45.54	4.47	0.903
BD.06679.994.7879.784.3780.025.166.430.00BD.07771.996.426.267.197.630.000DD.09075.738.2675.386.637.399.600.000BD.01170.148.026.637.237.718.720.000BD.01270.148.026.9517.227.778.710.000BD.01370.516.2737.574.018.077.758.720.000BD.01370.516.2737.574.018.677.750.000BD.0156.667.024.018.677.750.000BD.0156.657.647.050.0006.359.257.760.000BD.0176.137.107.646.866.62913.670.000BD.0176.534.653.05.64.745.0613.160.000BD.0175.554.6554.604.925.536.220.000BD.02355.476.6654.604.925.536.220.000BD.0247.1874.777.774.587.0413.460.000BD.0257.226.6113.644.024.0313.630.000BD.0247.827.726.644.744.144.157.720.000BD.0257.726.667.777.766.140.000BD.0247.85	IND_005	55.67	6.60	56.40	4.31	54.93	8.23	0.000
Bh D00     1.49     4.42     69.56     2.16     7.46     1.40     0.000       Bh D000     49.86     3.37     49.05     4.38     50.64     6.10     0.000       ND,010     51.98     4.36     52.25     4.39     51.71     4.53     0.000       ND,011     70.14     8.02     65.17     73.77     6.10     73.77     6.00       ND,012     70.81     8.78     74.99     6.88     75.62     10.01     0.000       ND,013     57.05     6.03     75.77     6.71     53.49     8.33     0.30       ND,015     6.041     1.06     70.00     6.38     92.36     1.37     0.000       ND,015     6.039     4.56     6.060     4.92     5.53     6.36     4.70     50.63     5.19     0.700       ND,020     7.76     0.03     3.19     0.700     0.76     0.76     0.76     0.76       ND,020     47.87     6.00     47.87     47.87     47.87	IND_006	79.90	4.78	79.78	4.37	80.02	5.16	0.432
HU000     #3.95     4.36     4.36     51.86     6.13     0.00       NP010     51.98     4.36     72.25     4.36     7.71     6.37     0.35       NP010     70.14     6.02     6.931     7.22     7.077     6.71     0.026       NP012     7.05     6.27     3.737     4.01     36.73     7.84     0.000       NP013     7.05     6.27     7.37     4.01     36.73     7.84     0.000       NP014     6.66     7.067     3.18     66.59     8.75     0.000       NP017     6.41     7.01     3.43     66.59     1.031     0.072       NP019     7.97     1.013     7.56     1.031     0.023     6.33     1.22     0.035       NP019     7.66     5.99     4.83     4.32     4.54     5.13     0.018       NP022     7.66     5.99     4.83     4.32     4.54     5.13     0.018       NP022     7.66     5.99     4.83	IND_007	71.99	9.42	69.56	7.16	74.43	10.70	0.000
NNO.01     1.03     4.4     5.25     3.38     1.17     2.65     0.035       NNO.11     70.14     6.02     6.51     7.22     7.07     6.71     0.035       ND.012     76.81     8.78     7.499     6.88     76.62     10.01     0.000       ND.014     6.317     6.08     70.67     3.18     6.63     0.077     6.00     0.000       ND.015     6.03     6.06     70.67     3.18     6.63     0.77     0.030       ND.015     6.93     4.53     5.36     4.78     0.031     0.000       ND.015     7.59     10.31     7.64     4.33     4.58     8.25     7.76     0.030       ND.015     7.59     10.81     4.50     4.14     7.55     10.81     0.000       ND.025     47.52     4.50     4.50     4.53     4.57     0.000       ND.025     57.7     1.50     4.53     4.58     8.77     0.000       ND.025     57.3     1.50 </td <td>IND_008</td> <td>49.86</td> <td>5.37</td> <td>49.05</td> <td>4.32</td> <td>50.68</td> <td>6.13</td> <td>0.000</td>	IND_008	49.86	5.37	49.05	4.32	50.68	6.13	0.000
NPD011     70.14     80.2     69.51     7.22     70.77     871     0.025       NPD012     76.81     8.78     7.99     6.88     7.62     1.00     0.000       NPD013     7.75     6.27     7.77     4.01     36.73     7.80     0.000       NPD015     66.81     1.08     7.93     4.01     36.73     7.80     0.000       NPD015     66.41     1.08     7.97     1.013     7.84     6.84     7.55     1.011     0.000       NPD019     59.59     4.95     6.95     4.70     5.63     1.011     0.000       NPD019     7.66     6.90     48.33     4.38     4.98     8.67     0.000       NPD221     7.46     6.40     47.43     5.41     8.74     0.31     6.22     0.100       NPD223     5.54     7.03     4.64     6.71     1.33     0.400       NPD224     5.54     1.18     8.56     7.71     87.66     1.18     0.000 <t< td=""><td>IND_009</td><td>/5./3</td><td>8.20</td><td>70.28</td><td>0.03</td><td>75.19</td><td>9.60</td><td>0.000</td></t<>	IND_009	/5./3	8.20	70.28	0.03	75.19	9.60	0.000
ND.012     76.81     87.8     74.99     6.88     78.62     10.01     0.000       ND.013     37.05     6.27     7.37     4.01     36.73     7.90     0.000       ND.015     60.63     6.66     70.57     3.18     68.52     3.57     0.000       ND.016     60.41     10.86     70.54     6.86     68.22     1.5.7     0.513       ND.017     94.18     7.10     96.04     4.48     4.6.98     6.7     0.000       ND.019     94.76     4.76     4.76     4.76     0.000     0.38     9.24     0.000     0.38     0.28     0.000	IND_010	70.14	8.02	69 51	7.95	70 77	4.33 8 71	0.030
DDDDDDCoCOCODDDDDDD,01453.176.426.6670.673.1866.321.3670.000DD,01666.4110.8670.673.1866.321.3670.000DD,01796.137.1096.006.3896.267.760.543DD,01876.5910.1375.401.1478.5610.810.000DD,01950.664.9043.34.884.684.670.000DD,02171.874.771.704.5812.640.000DD,02284.381.891.359.1487.401.340.000DD,02355.476.0654.064.2256.336.920.000DD,02431.716.0132.023.7431.417.620.000DD,02547.826.4047.494.4248.157.790.000DD,02666.237.886.7353.6465.130.0000.000DD,02785.611.798.027.761.421.4570.000DD,02880.321.19582.416.471.32.41.400.000DD,02918.021.9582.416.471.32.40.0000.000DD,02918.021.9582.416.471.32.40.0000.000DD,02918.021.952.5710.493.300.000DD,03080.321.96<	IND 012	76.81	8.78	74.99	6.88	78.62	10.01	0.000
ND.0145.176.985.2854.785.3.496.6.390.7.50.000ND.01666.4110.8670.5.46.6868.291.3.670.000ND.01796.137.1096.006.3896.267.7.60.543ND.01750.594.550.0564.7.00.0331.010.0723ND.01750.594.550.0564.7.00.0331.010.0723ND.0214.7.674.7.74.7.04.844.7.401.3.40.000ND.02254.376.0654.604.9.26.3.31.4.60.000ND.02355.476.0654.604.9.26.5.31.3.40.000ND.02431.716.064.7.494.224.3.17.20.000ND.0256.2.37.856.7.55.46.121.0.370.000ND.0266.2.37.856.7.491.3.221.0.370.000ND.0278.5.631.1.798.3.607.1787.661.47.90.000ND.0281.20.711.0.611.8.146.471.23.361.3.030.000ND.0291.20.711.0.611.8.146.471.23.361.3.020.000ND.0391.0.611.8.146.471.23.361.3.020.000ND.0391.0.541.0.771.0.611.0.771.0.611.0.20ND.0391.0.571.0.573.3.111.0.200.000	IND_013	37.05	6.27	37.37	4.01	36.73	7.90	0.000
IND.01506.036.6670.673.1868.298.750.000IND.01660.411.0860.63866.291.03670.000IND.01796.137.1066.006.3866.267.760.030IND.01850.394.5580.864.7080.865.100.776IND.01950.394.5580.864.7080.865.100.776IND.02284.381.8981.369.1487.401.340.000IND.02355.476.0132.023.743.147.620.000IND.02431.716.0132.023.743.147.620.000IND.02566.237.8567.353.6465.131.0370.000IND.02785.541.07980.307.1787.641.14.790.000IND.02884.271.961.96.424.81.57.980.000IND.02918.071.961.92.216.571.92.240.000IND.02980.321.969.941.92.20.0020.002IND.03184.271.969.92.321.160.000IND.03219.641.972105.927.75104.991.3020.000IND.03310.641.072105.927.75104.991.3020.000IND.04185.467.7185.323.160.969.410.000IND.04166.631.1666	IND_014	53.17	6.98	52.85	4.78	53.49	8.63	0.318
ND,01669,4110.8670.546.666.6217.670.000ND,01766,1371.096,606.3896,267.760.54ND,01920.534.555.254.7050,635.190.77ND,00241.976.9748.354.584.684.690.000ND,02254.376.974.534.584.696.70.000ND,02355.476.6654.604.9255.316.920.000ND,02431.716.164.744.424.157.890.149ND,02547.826.4047.494.424.157.890.000ND,02566.237.856.7.353.6465.121.0.370.000ND,02666.231.17983.607.1787.661.4790.000ND,0281.29.7410.611.18.146.471.22.61.3.030.000ND,0288.851.19.58.7.70.0051.4.500.0000.000ND,0288.851.07210.522.531.04.80.0000.000ND,03659.693.446.0732.7018.480.000ND,03669.637.766.522.770.0000.000ND,03669.647.761.533.640.0000.000ND,03669.647.762.533.640.193.530.000ND,03669.637.76 <t< td=""><td>IND_015</td><td>69.63</td><td>6.66</td><td>70.67</td><td>3.18</td><td>68.59</td><td>8.75</td><td>0.000</td></t<>	IND_015	69.63	6.66	70.67	3.18	68.59	8.75	0.000
IND,017   96.13   7.10   96.00   6.88   95.26   7.76   0.543     IND,019   50.39   4.95   90.56   4.70   50.63   5.19   0.772     IND,020   74.76   6.50   4.13   4.38   46.39   8.67   0.000     IND,021   74.78   4.79   71.75   4.51   72.26   0.000     IND,024   31.71   6.01   20.22   27.44   31.41   7.62   0.000     IND,025   67.32   67.40   47.9   4.42   48.15   7.89   0.149     IND,026   66.33   7.75   67.35   3.64   65.12   1.37   0.000     IND,027   15.05   7.75   3.64   65.12   1.303   0.000     IND,028   12.871   10.06   12.62.2   6.53   13.33   0.000     IND,029   12.074   10.61   11.81.4   6.47   12.33.6   13.03   0.000     IND,030   80.32   11.50   7.82.4   6.78   82.92   15.55   0.000     IND,040	IND_016	69.41	10.86	70.54	6.86	68.29	13.67	0.000
NbD.018     76.97     10.13     75.40     9.14     78.56     10.81     0.0000       NbD.019     50.53     4.55     50.56     4.70     50.63     5.19     0.000       NbD.021     71.67     4.77     71.70     4.53     4.53     4.53     4.53     0.000       NbD.022     44.43     11.69     4.52     2.24     4.14     1.46     0.0000       NbD.025     47.92     6.40     47.49     4.42     4.15     7.59     0.100       NbD.026     66.33     7.85     67.55     3.64     65.12     1.037     0.000       NbD.028     128.71     10.61     118.14     6.47     12.36     1.30.3     0.000       NbD.031     84.37     11.95     82.61     6.78     82.41     1.50     0.001       NbD.032     128.71     10.61     118.14     6.47     12.36     1.30.2     0.002       NbD.033     105.45     10.72     10.52     7.75     10.49     3.33     0.000 <td>IND_017</td> <td>96.13</td> <td>7.10</td> <td>96.00</td> <td>6.38</td> <td>96.26</td> <td>7.76</td> <td>0.543</td>	IND_017	96.13	7.10	96.00	6.38	96.26	7.76	0.543
ND.019   50.59   4.95   50.56   4.70   50.63   5.19   0.772     ND.020   71.67   6.70   4.33   4.38   4.08   8.67   0.000     ND.021   71.87   4.77   71.76   4.33   72.014   51.31   0.000     ND.022   54.67   1.06   4.00   4.43   74.43   74.60   0.000     ND.023   37.47   0.01   32.02   37.4   31.41   7.62   0.000     ND.025   47.82   67.35   36.44   65.12   1.037   0.000     ND.026   66.23   7.85   67.35   36.44   67.81   82.41   0.30   0.000     ND.027   86.56   1.150   78.24   6.78   82.41   14.50   0.000     ND.033   106.45   10.72   105.92   7.75   104.99   13.02   0.002     ND.033   106.45   10.72   105.92   7.75   104.99   13.02   0.002     ND.033   106.45   10.71   55.22   31.1   58.00   11.4   0.	IND_018	76.97	10.13	75.40	9.14	78.56	10.81	0.000
NLU.20     71.05     6.70     45.3     4.83     9.03     6.07     0.008       ND.022     71.87     4.78     1.13     4.83     72.04     5.13     0.138       ND.022     64.39     1.66     62.02     3.74     1.41     7.62     0.000       ND.025     47.62     6.40     47.49     4.42     4.81     7.89     0.100       ND.026     66.32     7.85     67.35     3.64     65.12     1.037     0.000       ND.026     65.33     1.1.29     83.60     7.17     87.66     1.479     0.000       ND.028     128.71     1.068     126.22     6.53     131.22     12.17     0.000       ND.031     84.27     1.1.56     7.824     6.78     82.41     1.459     0.000       ND.033     105.45     1.0.72     105.92     7.75     104.99     1.302     0.000       ND.034     39.10     1.324     37.24     3.21     4.96     1.020     0.000 <td< td=""><td>IND_019</td><td>50.59</td><td>4.95</td><td>50.56</td><td>4.70</td><td>50.63</td><td>5.19</td><td>0.772</td></td<>	IND_019	50.59	4.95	50.56	4.70	50.63	5.19	0.772
IND.302     6.4.5     1.7.6     4.7.4     2.8.4     2.1.5     0.1.83       IND.224     5.4.7     1.6.6     5.4.6     3.2.2     3.2.4     8.6.3     1.5.6     0.000       IND.225     4.7.8     1.7.1     6.6.0     4.4.0     4.4.1     7.5.2     0.000       IND.255     4.7.8     7.8.5     6.7.35     3.6.4     6.5.12     1.0.3.7     0.000       IND.025     66.23     7.8.5     6.7.35     3.6.4     6.512     1.0.3.7     0.000       IND.028     128.7.7     10.061     118.14     6.47     123.36     1.0.00     0.000       IND.030     80.32     11.50     7.82.4     6.78     8.2.41     1.4.50     0.000       IND.031     18.45     1.0.72     105.92     7.75     104.99     1.0.2     0.012       IND.035     59.69     3.44     6.73     2.70     58.65     3.77     0.000       IND.035     59.69     3.44     6.03.7     2.5.3     3.41     8.66     0.00	IND_020	47.00	6.90	48.33	4.38	46.98	8.6/ E 12	0.000
ND.022     54.97     6.06     54.00     4.02     6.33     6.92     0.000       NN.023     31.41     7.89     0.101       ND.025     64.22     7.84     67.25     3.64     65.12     1.03     0.000       NN.026     66.23     7.85     7.77     87.06     1.479     0.000       NN.028     120.74     10.61     118.14     6.47     1.31.22     1.21     0.000       NN.029     120.74     10.61     118.14     6.47     1.32.5     0.000       NN.031     84.27     11.55     82.61     6.54     82.41     1.65.0     0.000       NN.033     105.45     10.72     105.92     7.75     19.49     1.302     0.002       NN.034     30.10     13.24     37.24     3.21     40.06     18.28     0.000       NN.035     62.22     3.24     63.25     2.53     3.94     0.000       NN.036     59.65     3.77     0.000     NN.038     66.63     7.11	IND_021 IND_022	71.07 84.38	4.77	71.70 81.36	4.30	72.04	13.46	0.188
NN.024     31.71     6.01     32.02     37.4     31.41     7.62     0.003       NN.025     47.82     6.40     47.49     4.42     48.15     7.99     0.119       NN.026     6.6.23     7.85     67.35     3.64     65.12     10.37     0.000       NN.027     85.63     11.79     83.60     7.17     87.66     14.79     0.000       NN.028     128.71     10.061     118.14     647     123.64     13.03     0.000       NN.030     80.32     11.50     78.24     6.78     82.41     14.50     0.000       NN.031     84.47     11.95     82.61     6.74     85.83     12.07     0.015       NN.033     105.45     10.72     105.92     7.75     104.99     13.02     0.002       NN.034     39.10     13.24     37.4     3.21     61.30     5.3     0.000       NN.035     62.22     3.23     61.14     65.7     0.000     0.000     0.000     0.000	IND 023	55 47	6.06	54 60	4 92	56.33	6.92	0.000
NN.02547.826.4047.494.4248.157.990.140NN.02666.237.8567.353.6465.1210.370.000NN.02785.6311.7983.607.1787.6614.790.000NN.028128.7110.08126.226.53131.2212.770.000NN.029120.7410.61118.146.4712.3613.030.000NN.03080.3211.5078.246.7882.4114.500.000NN.03184.2711.9582.616.9485.9215.250.000NN.033105.4510.72105.927.75104.9913.020.002NN.03493.1013.2437.243.2140.9913.020.000NN.03562.223.2462.252.5361.195.330.000NN.03650.693.4460.732.7058.653.770.000NN.03860.887.8150.123.3562.6610.240.000NN.04366.634.1866.463.0566.805.070.83NN.04498.506.7136.762.5539.418.960.000NN.04366.634.1866.463.0566.805.070.83NN.04436.192.26765.007.117.30.60.770.80NN.04436.192.27945.374.840.1000.000 <trr< td=""><td>IND 024</td><td>31.71</td><td>6.01</td><td>32.02</td><td>3.74</td><td>31.41</td><td>7.62</td><td>0.000</td></trr<>	IND 024	31.71	6.01	32.02	3.74	31.41	7.62	0.000
IND.02666.237.8567.353.6465.1210.370.000IND.02785.601.17985.607.1787.6014.790.000IND.028128.7110.08126.226.5311.2212.170.000IND.039120.7110.61118.146.4712.3613.020.000IND.03080.3211.5072.446.7882.4114.500.000IND.03184.2711.9582.616.7485.9215.250.000IND.03298.859.9090.117.1219.8512.070.015IND.03310.5410.7210.5927.7510.49618.280.000IND.0356.223.246.322.516.140.0000.002IND.03659.693.446.0732.708.653.770.000IND.03757.117.7155.323.148.640.000IND.0386.0887.8150.123.356.26510.240.000IND.04040.586.4332.282.7241.898.490.000IND.0416.042.355.376.143.010.302IND.0416.043.012.323.645.770.60IND.0416.043.012.323.625.070.331IND.0416.634.186.643.012.344.193.010.302IND.0443.13 <td>IND 025</td> <td>47.82</td> <td>6.40</td> <td>47.49</td> <td>4.42</td> <td>48.15</td> <td>7.89</td> <td>0.149</td>	IND 025	47.82	6.40	47.49	4.42	48.15	7.89	0.149
IND.02785.6311.7985.607.1787.6614.790.000IND.028126.7410.61126.226.5313.12212.170.000IND.02980.3211.5078.246.7482.3613.360.000IND.03184.2711.9578.246.7485.9215.250.000IND.03298.8510.7210.59.27.75104.9913.020.002IND.033105.4510.7210.59.27.75104.9913.020.000IND.03562.223.2462.252.5361.193.530.000IND.03659.693.4460.732.7058.653.770.000IND.03757.117.7155.323.1158.9010.140.000IND.04860.867.8139.262.5539.418.490.000IND.04940.566.4339.282.7241.898.490.000IND.04162.0420.3958.3761.465.722.720.003IND.04269.022.26765.007.117.900.001IND.04366.634.1866.643.0566.805.070.83IND.04436.194.4635.102.590.2780.004IND.0459.850.469.98.76.480.1940.010IND.0468.958.738.920.189.860.570.27IND.047 </td <td>IND_026</td> <td>66.23</td> <td>7.85</td> <td>67.35</td> <td>3.64</td> <td>65.12</td> <td>10.37</td> <td>0.000</td>	IND_026	66.23	7.85	67.35	3.64	65.12	10.37	0.000
IND.028128.7110.08126.226.53131.2212.170.000IND.02912.0710.61118.146.7412.3613.030.000IND.03184.3211.9582.616.7882.4114.500.000IND.03298.859.0099.117.1298.5812.070.015IND.03310.5410.72105.927.7810.4913.020.002IND.03499.1013.2437.243.2140.9618.380.000IND.03562.223.3462.252.5061.140.000IND.03659.693.4460.732.7058.653.770.000IND.03757.117.7155.323.1159.0910.140.000IND.03860.887.8139.282.7241.898.960.000IND.04162.0420.3958.3761.467.72.720.000IND.04269.022.6765.007.117.0530.770.031IND.04366.514.1865.463.055.070.8310.002IND.04469.022.6765.007.117.0530.770.001IND.0459.856.7389.28.9686.578.850.000IND.04688.956.7389.28.9686.738.960.002IND.0459.1310.3610.6559.1110.941.130.034	IND_027	85.63	11.79	83.60	7.17	87.66	14.79	0.000
IND.029I20.74I.0.51I18.146.47I23.36I3.030000IND.03085.32I1.5078.246.7882.41I4.500.000IND.03184.27I1.9582.616.9485.92I5.250.000IND.033105.45I0.72105.927.75104.9913.020.002IND.03439.1013.2437.2432.140.9618.280.000IND.03552.223.2463.252.5361.193.530.000IND.03656.963.4460.732.7058.653.770.000IND.03757.117.7155.323.1158.9010.140.000IND.0386.887.8130.522.5539.418.960.000IND.04040.556.4332.822.7241.898.490.000IND.04162.042.3958.376.1465.722.7.720.000IND.04366.634.1866.403.056.635.070.631IND.04456.192.46765.007.117.3053.0.770.600IND.0459.858.738.9328.968.8578.480.184IND.0459.858.738.9328.968.8578.480.6220.000IND.0459.152.041.052.171.030.120.002IND.04618.958.738.941.130.040<	IND_028	128.71	10.08	126.22	6.53	131.22	12.17	0.000
IND.03080.3211.5078.246.7882.4114.500.000IND.03184.2711.9582.616.9485.9215.250.000IND.03298.859.9099.117.1298.5812.070.015IND.03310.5410.7210.527.7510.49.9913.020.002IND.03562.223.2462.3561.193.530.000IND.03659.693.4460.732.7058.653.770.000IND.03757.117.7153.233.1158.9010.140.000IND.03860.887.8159.123.3562.6510.240.000IND.04040.586.4339.282.7241.898.490.000IND.04162.042.3958.376.1465.722.77.20.000IND.04366.634.1866.643.0566.805.070.831IND.04436.192.4636.102.223.62.822.590.831IND.04499.850.4699.820.1899.850.620.000IND.0448.998.1398.703.5499.461.0.940.499IND.04599.850.469.875.266.6839.160.526IND.04599.850.564.705.659.1110.991.130.84IND.04519.981.550.144.104.544.700	IND_029	120.74	10.61	118.14	6.47	123.36	13.03	0.000
IND.03184.2711.9582.616.9485.9215.250.000IND.03298.859.9091.117.1298.8312.070.015IND.03439.1013.2437.243.2140.9618.280.000IND.03562.223.2463.252.5361.193.530.000IND.03659.693.4460.732.7058.653.770.000IND.03757.117.7155.323.1158.0910.140.000IND.0386.087.8130.562.5539.418.960.000IND.04040.586.4339.282.7241.898.490.000IND.04162.0420.3958.376.1465.722.720.000IND.04366.6341.866.463.0566.805.070.331IND.04465.992.4636.102.3236.282.590.278IND.04599.850.4699.820.1899.880.620.000IND.04688.558.7389.328.5688.578.480.189IND.04599.050.1699.820.1899.4610.340.049IND.04413.991.130.0440.5269.11109.981.230.000IND.04510.8.1110.659.141.044.740.9030.526IND.05570.148.029.0778.743.010.0	IND_030	80.32	11.50	78.24	6.78	82.41	14.50	0.000
IND.04298.8590.097.117.1298.851.2.070.013IND.03310.54510.7210.5927.75104.9913.020.002IND.03562.223.2463.252.5361.193.530.000IND.03659.693.4460.732.7058.653.770.000IND.03757.117.7155.323.1158.9010.140.000IND.03860.887.8159.123.3562.6510.240.000IND.04040.586.4339.282.7241.898.490.000IND.04162.0420.3958.376.1465.722.7720.000IND.04269.0222.6765.007.1173.0530.770.000IND.04366.634.1866.463.0566.805.070.831IND.04436.192.4636.102.3236.282.590.278IND.04599.850.4699.820.1899.860.620.000IND.0468.958.7389.328.9688.578.480.199IND.04799.088.1399.723.5499.4610.940.002IND.04841.372.7941.542.5441.193.010.002IND.05411.981.130.6459.1110.9981.130.646IND.05570.148.026.657.456.6275.20	IND_031	84.27	11.95	82.61	6.94	85.92	15.25	0.000
InD.0310.7.110.7.210.7.210.7.210.7.200.00IND.04433.1013.2437.243.2140.9618.200000IND.05562.223.2463.252.5361.193.530.000IND.03656.693.4460.732.7058.653.770.000IND.03757.117.7155.323.1158.9010.140.000IND.03860.887.8139.123.3562.6510.240.000IND.04040.586.4339.282.7241.898.490.000IND.04162.0420.3958.376.1465.7227.720.000IND.04366.634.1866.463.0566.805.070.831IND.04436.192.4636.102.3236.282.590.278IND.04488.958.738.9328.9688.578.481.189IND.04488.958.738.9328.9688.578.481.049IND.04481.372.7941.542.5441.193.010.032IND.04488.958.736.6275.2066.859.160.526IND.04410.3510.6559.1110.99811.230.000IND.04510.83110.36106.659.1110.99811.230.000IND.0557.044.2845.414.104.544.470.025 <td< td=""><td>IND_032</td><td>98.85 105.45</td><td>9.90</td><td>99.11 105.02</td><td>7.12</td><td>98.58</td><td>12.07</td><td>0.015</td></td<>	IND_032	98.85 105.45	9.90	99.11 105.02	7.12	98.58	12.07	0.015
IND.035     62.22     3.24     63.25     2.53     61.19     3.53     0.000       IND.036     59.69     3.44     60.73     2.70     58.65     3.77     0.000       IND.037     57.11     7.71     55.32     3.11     58.90     10.14     0.000       IND.038     60.88     7.81     59.12     3.35     62.65     10.24     0.000       IND.040     40.58     6.43     39.28     2.72     41.89     8.49     0.000       IND.041     62.04     2.039     58.37     6.14     65.72     2.77.2     0.000       IND.042     69.02     2.267     65.00     7.11     7.305     3.0.77     0.000       IND.043     66.19     2.267     65.00     7.11     7.305     3.0.77     0.000       IND.044     86.19     2.46     36.10     2.32     36.28     2.59     0.28       IND.045     9.985     0.46     9.982     0.18     0.10     0.000       IND.044	IND_033	39.10	13.24	37.24	3.21	40.96	18.28	0.002
IND 103659.693.4460.732.7058.653.770.000IND.03860.817.7155.323.1158.9010.140.000IND.03860.887.8159.123.3562.6510.240.000IND.04040.686.4339.222.7241.898.490.000IND.04162.0420.3958.376.1465.722.7.720.000IND.04269.022.2.6765.007.117.3053.0.770.000IND.04366.634.1866.463.056.68.05.070.831IND.04436.192.469.820.1898.860.620.000IND.0459.856.738.9.328.968.578.480.189IND.0468.958.738.9.328.968.578.480.189IND.0479.088.139.8703.5499.461.0.940.049IND.04841.372.7941.542.5441.193.010.003IND.050108.3110.36106.659.11109.9811.230.000IND.0516.6567.456.6275.206.6859.160.526IND.0524.5474.284.5414.1045.544.470.933IND.0557.0148.026.9517.227.078.710.000IND.0557.0148.026.9517.227.025.01<	IND 035	62.22	3.24	63.25	2.53	61.19	3.53	0.000
IND 03757.1177.155.323.1158.9010.140.000IND 03860.887.8159.123.3562.6510.240.000IND 04040.586.713.6762.553.94.18.960.000IND 04162.0420.3958.376.1465.7227.720.000IND 04366.634.1866.643.0566.805.070.81IND 04436.192.4636.102.3236.282.590.278IND 04599.850.4699.820.1899.880.620.000IND 04499.858.738.93.28.968.578.480.199IND 04599.088.1398.722.544.193.010.003IND 0468.957.4566.671.1731.931.130.084IND 0479.088.1398.703.549.9461.0.940.494IND 04931.981.153.2.041.1731.931.130.084IND 05010.8.3110.36106.651.10109.981.1230.000IND 05165.657.4566.275.2066.859.160.572IND 054119.987.52.109.2798.841.47.341064.860.000IND 0557.048.026.957.728.770.210.01IND 0557.048.027.050.040.030.000 <td>IND_036</td> <td>59.69</td> <td>3.44</td> <td>60.73</td> <td>2.70</td> <td>58.65</td> <td>3.77</td> <td>0.000</td>	IND_036	59.69	3.44	60.73	2.70	58.65	3.77	0.000
IND.03860.887.8159.123.8562.6510.240.000IND.04040.586.4339.282.7241.898.490.000IND.04162.0420.3958.376.1465.7227.720.000IND.04260.0222.6765.007.1173.0530.770.831IND.04366.634.1866.463.0566.805.070.831IND.04436.192.4636.102.3236.282.590.268IND.04599.850.4699.820.1899.860.4040.404IND.04688.958.7389.328.9688.578.480.189IND.04790.088.1399.703.549.941.03.010.003IND.04841.372.7941.542.5441.193.010.003IND.04931.981.03.6106.659.11109.981.12.30.000IND.05166.567.4566.275.2066.859.160.52IND.05350.594.7050.685.190.7721.0025IND.05411.98752.1092.798.841.73.41.064.860.000IND.05570.148.0269.517.227.078.710.022IND.0562.12.92.482.1441.882.342.341.340.000IND.0573.056.911.033.677.080.000 <td>IND_037</td> <td>57.11</td> <td>7.71</td> <td>55.32</td> <td>3.11</td> <td>58.90</td> <td>10.14</td> <td>0.000</td>	IND_037	57.11	7.71	55.32	3.11	58.90	10.14	0.000
IND.03938.096.7136.762.5539.418.960.000IND.04040.586.4339.282.7241.898.490.000IND.04162.0420.3958.376.1465.7227.720.000IND.04269.022.26765.007.1173.0530.770.000IND.04366.634.1866.463.0566.805.070.0831IND.04436.192.4636.102.3236.280.560.000IND.0459.850.469.820.189.980.620.000IND.04688.958.738.9328.9685.578.480.189IND.0479.088.1398.703.549.41.93.010.003IND.04931.981.1532.041.1731.931.130.044IND.05166.567.4566.275.2066.859.160.526IND.05245.474.2845.414.1045.544.479.90IND.054119.987.52.1092.798.84147.341064.860.000IND.0557.019.605.694.075.635.190.722IND.0557.046.611.982.743.827.900.000IND.0557.046.511.932.492.378.870.218IND.0562.296.511.933.827.900.000IND.05	IND_038	60.88	7.81	59.12	3.35	62.65	10.24	0.000
IND_04040.586.4339.282.7241.898.490.000IND_04162.042.0358.3761.465.7227.720.000IND_04269.0222.6765.007.1173.0530.770.001IND_04466.634.1866.463.0566.805.070.831IND_04599.850.4699.820.1899.880.620.000IND_04688.958.7389.328.968.8.578.480.189IND_04799.088.1398.703.5499.4610.940.049IND_04841.372.7941.542.5441.193.010.031IND_04913.891.1532.041.1731.931.130.084IND_050108.3110.36106.659.1110.99811.230.000IND_05166.567.4566.275.2066.859.160.526IND_05350.594.9550.564.7050.635.190.772IND_054119.98752.0092.798.84147.341064.860.000IND_05570.148.0269.517.2270.778.710.025IND_05621.292.4821.241.8821.342.960.461IND_05570.148.0269.517.2270.778.710.000IND_05621.292.4821.541.8821.342.96	IND_039	38.09	6.71	36.76	2.55	39.41	8.96	0.000
IND_04162.0420.3958.376.1465.7227.720.000IND_04269.0222.6765.007.1173.0530.770.831IND_04436.192.4636.102.3236.282.590.278IND_04599.850.4699.820.1899.880.620.000IND_04688.958.7389.328.9688.578.480.189IND_04799.088.1398.703.5499.4610.940.049IND_04841.372.7941.542.5441.193.010.003IND_04931.981.1532.041.1731.931.130.084IND_05166.567.4566.275.2066.859.160.526IND_0524.5474.2845.414.1045.544.470.903IND_05350.594.9550.564.7050.635.190.772IND_05411.998752.1092.798.84147.341064.860.000IND_05570.148.0269.517.2270.778.710.025IND_05570.148.0269.517.2270.778.870.000IND_05570.148.0269.517.2270.778.710.000IND_05570.148.0269.517.2270.778.710.000IND_05570.148.0269.517.2270.50.000	IND_040	40.58	6.43	39.28	2.72	41.89	8.49	0.000
IND_04269.0222.6765.007.1173.0530.770.000IND_04366.634.1866.463.0566.805.070.831IND_04436.192.4636.102.3236.282.590.278IND_04599.850.4699.820.1899.880.620.000IND_04799.088.1398.703.5499.4610.940.049IND_04841.372.7941.542.5441.193.010.003IND_050108.3110.36106.659.11109.9811.230.000IND_05166.567.4566.275.2066.859.160.526IND_05245.474.2845.414.1045.544.470.903IND_05350.5970.148.0269.517.2270.778.710.025IND_054119.98752.1092.798.84147.341064.860.000IND_05570.148.0269.517.2270.778.710.025IND_05570.148.026.517.327.000.4640.000IND_05898.556.909.076.7198.027.050.004IND_0592.156.511.333.3338.267.080.000IND_05419.043.3338.267.080.000IND_0556.610.0723.7431.417.620.000IND_05	IND_041	62.04	20.39	58.37	6.14	65.72	27.72	0.000
IND_04360.634.1660.495.0560.605.070.851IND_04436.192.4636.102.3236.282.590.000IND_04599.850.4699.820.1899.880.620.000IND_04688.958.7389.328.9688.578.480.189IND_04799.088.1399.723.5499.4610.940.003IND_04841.372.7941.542.5441.193.010.003IND_04931.981.1532.041.1731.931.130.084IND_05166.567.4566.275.2066.859.160.526IND_05166.567.4566.275.2066.859.160.526IND_05350.594.9550.564.7050.635.190.002IND_054119.98752.1092.798.84147.341064.860.000IND_05570.1480.265.177.227.078.710.025IND_05521.292.4821.241.8821.342.960.455IND_05539.605.699.076.7198.027.050.004IND_0502.444.082.5862.752.7025.010.000IND_06137.056.511.932.492.378.870.218IND_06231.716.0132.023.7431.417.620.000	IND_042	69.02	22.67	65.00	7.11	73.05	30.77	0.000
IND_04599.850.4699.820.1890.880.620.000IND_04688.958.7389.328.9688.578.480.189IND_04799.088.1398.703.5499.4610.940.049IND_04841.372.7941.542.5441.193.010.003IND_04931.981.1532.041.1731.931.130.084IND_050108.3110.36106.659.11109.9811.230.000IND_05166.567.4566.275.2066.859.160.52IND_05245.474.2845.414.1045.544.470.903IND_05350.594.9550.564.7050.635.190.772IND_054119.98752.1092.798.84147.341064.860.000IND_05570.148.0269.517.2270.778.710.025IND_05621.292.4821.241.8821.342.960.455IND_05739.605.6940.943.3338.267.050.004IND_0592.156.511.932.492.378.870.218IND_05137.056.2737.374.0136.737.900.000IND_06231.716.0132.023.743.1417.620.000IND_0656.5811.9081.4310.417.4811.620.0	IND_043	36.19	4.10	36.10	2.03	36.28	2.59	0.031
IND.04388.958.7389.328.9688.578.480.189IND.04799.088.1398.703.5499.4610.940.049IND.04341.372.7941.542.5441.193.010.084IND.050108.3110.36106.659.11109.9811.230.000IND.05245.474.2845.414.1045.544.470.903IND.05350.594.9550.564.7050.635.190.772IND.05570.148.0269.517.2270.778.710.025IND.05570.148.0269.517.2270.778.710.025IND.05570.148.0269.517.2270.778.710.025IND.05621.292.4821.241.8821.342.960.404IND.05739.605.6940.943.3338.267.080.000IND.0592.156.511.932.492.378.870.218IND.0592.156.511.932.492.378.620.000IND.06231.716.0132.023.7431.417.620.000IND.0656.5811.9081.4310.417.24811.620.000IND.0656.5811.9081.4310.417.24811.620.000IND.0656.5811.9069.809.7661.9610.780.002 <td>IND 045</td> <td>99.85</td> <td>0.46</td> <td>99.82</td> <td>0.18</td> <td>99.88</td> <td>0.62</td> <td>0.000</td>	IND 045	99.85	0.46	99.82	0.18	99.88	0.62	0.000
IND_04799.088.1398.703.5499.4610.940.049IND_04841.372.7941.542.5441.193.010.003IND_04931.981.1532.041.1731.931.130.084IND_050108.3110.36106.659.11109.9811.230.000IND_05166.567.4566.275.2066.859.160.526IND_05245.474.2845.414.1045.544.470.903IND_054119.98752.1092.798.84147.341064.860.000IND_05570.148.0269.517.2270.778.710.025IND_05570.148.0269.517.2270.778.710.025IND_05570.148.0269.517.2270.778.710.025IND_05570.148.0269.517.027.050.004IND_05739.605.6999.076.7198.027.050.004IND_05898.556.9099.076.7198.027.050.004IND_05026.444.0825.862.7527.025.010.000IND_06137.056.2737.374.0136.737.900.000IND_06476.9611.9081.4310.417.24811.620.000IND_06565.8811.0069.809.7661.9610.780.000 <td>IND 046</td> <td>88.95</td> <td>8.73</td> <td>89.32</td> <td>8.96</td> <td>88.57</td> <td>8.48</td> <td>0.189</td>	IND 046	88.95	8.73	89.32	8.96	88.57	8.48	0.189
IND.04841.372.7941.542.5441.193.010.003IND.050108.311.1532.041.1731.931.130.084IND.051108.5110.36106.659.11109.9811.230.000IND.05245.474.2866.275.2066.859.160.526IND.05350.594.9550.564.7050.635.190.772IND.054119.98752.1092.798.84147.341064.860.025IND.0557.148.0269.517.227.0778.710.225IND.0557.148.0269.517.227.0778.710.025IND.05539.605.699.073.3338.267.080.004IND.05898.556.9099.076.7198.027.050.004IND.0592.156.511.932.492.708.870.218IND.0502.6444.082.562.752.7025.010.000IND.06137.056.2737.374.0136.737.900.000IND.06231.716.013.2023.7431.417.620.000IND.06476.9611.9081.4310.417.4811.620.000IND.0656.8811.006.989.766.961.0780.000IND.0656.8411.006.983.093.3413.970.815 </td <td>IND_047</td> <td>99.08</td> <td>8.13</td> <td>98.70</td> <td>3.54</td> <td>99.46</td> <td>10.94</td> <td>0.049</td>	IND_047	99.08	8.13	98.70	3.54	99.46	10.94	0.049
IND.04931.981.1532.041.1731.931.130.084IND.050108.3110.36106.659.11109.9811.230.001IND.05166.567.4566.275.2066.859.160.526IND.05245.474.2845.414.1045.544.470.903IND.05350.594.9550.564.7050.635.190.772IND.054119.98752.1092.798.84147.341064.860.025IND.0557.0148.0269.517.2270.778.710.025IND.05621.292.4821.241.8821.342.960.455IND.05739.605.6940.943.3338.267.080.004IND.05898.556.511.932.492.378.870.218IND.0502.156.511.932.492.378.870.218IND.06026.444.0825.862.7527.025.010.000IND.06137.056.2737.374.0136.737.900.000IND.0647.69611.9081.4310.417.24811.620.000IND.06554.8811.0069.803.0933.413.970.815IND.06634.626.5334.056.0035.206.980.002IND.06654.5914.15153.4313.20155.7614.96<	IND_048	41.37	2.79	41.54	2.54	41.19	3.01	0.003
IND_050108.3110.36106.659.11109.9811.230.000IND_05166.667.4566.275.2066.859.160.526IND_05245.474.2845.414.1045.544.470.003IND_05350.594.9550.564.7050.635.190.772IND_054119.98752.1092.798.84147.341064.860.000IND_05570.148.0269.517.2270.778.710.025IND_05739.605.6940.943.3338.267.080.000IND_05898.556.9099.076.7198.027.050.004IND_0592.156.511.932.492.378.870.218IND_06026.444.0825.662.7527.025.010.000IND_06137.056.2737.374.0136.737.900.000IND_06343.385.1644.723.0942.036.340.000IND_06476.9611.9081.4310.417.24811.620.000IND_0656.5811.0069.803.093.3413.970.815IND_06634.626.5333.603.093.413.970.815IND_06733.513.5633.603.093.413.970.815IND_068154.5914.1515.34313.2015.7614.96 <t< td=""><td>IND_049</td><td>31.98</td><td>1.15</td><td>32.04</td><td>1.17</td><td>31.93</td><td>1.13</td><td>0.084</td></t<>	IND_049	31.98	1.15	32.04	1.17	31.93	1.13	0.084
IND_05166.567.4566.275.2066.859.160.526IND_05245.474.2845.414.1045.544.470.903IND_05350.594.9550.564.7050.635.190.772IND_054119.98752.1092.798.84147.341064.860.000IND_05570.148.0269.517.2270.778.710.255IND_05621.292.4821.241.8821.342.960.403IND_05739.605.6940.943.3338.267.080.000IND_05898.556.9099.076.7198.027.050.004IND_0592.156.511.932.492.378.870.218IND_06026.444.0825.062.7527.025.010.000IND_06137.056.2737.374.0136.737.900.000IND_06343.385.1644.723.0942.036.340.000IND_06476.9611.9081.431.0417.24811.620.000IND_0656.5811.0069.803.976.340.002IND_06634.626.5334.056.0035.206.980.002IND_06733.513.5633.603.9933.413.970.815IND_068154.5914.1515.34313.20155.7614.960.009 <td>IND_050</td> <td>108.31</td> <td>10.36</td> <td>106.65</td> <td>9.11</td> <td>109.98</td> <td>11.23</td> <td>0.000</td>	IND_050	108.31	10.36	106.65	9.11	109.98	11.23	0.000
IND_05245.474.2845.414.1045.544.470.903IND_05350.594.9550.564.7050.635.190.772IND_054119.98752.1092.798.84147.341064.860.000IND_05570.148.0269.517.2270.778.710.255IND_05621.292.4821.241.8821.342.960.455IND_05739.605.6940.943.3338.267.080.000IND_0592.156.511.932.492.378.870.218IND_06026.444.0825.862.7527.025.010.000IND_06137.056.2737.374.0136.737.900.000IND_06231.716.0132.023.7431.417.620.000IND_06343.385.1644.723.0942.036.340.000IND_06476.9611.9081.431.04172.4811.620.000IND_06565.8811.0069.809.7661.9610.780.001IND_06634.626.5334.056.0035.206.980.002IND_06733.513.5633.603.0933.413.970.815IND_068154.5914.15153.4313.20155.7614.960.009IND_06974.376.9174.047.6374.706.01 <t< td=""><td>IND_051</td><td>66.56</td><td>7.45</td><td>66.27</td><td>5.20</td><td>66.85</td><td>9.16</td><td>0.526</td></t<>	IND_051	66.56	7.45	66.27	5.20	66.85	9.16	0.526
IND_05350.594.9550.504.7050.635.190.772IND_054119.98752.1092.798.84147.341064.860.000IND_05570.148.0269.517.2270.778.710.025IND_05621.292.4821.241.8821.342.960.455IND_05739.605.6940.943.3338.267.080.000IND_05898.556.9099.076.7198.027.050.004IND_0592.156.511.932.492.378.870.218IND_0602.6.444.0825.862.7527.025.010.000IND_06137.056.2737.374.0136.737.900.000IND_06231.716.0132.023.7431.417.620.000IND_06476.9611.9081.4310.4172.4811.620.000IND_06565.8811.0069.809.7661.9610.780.000IND_06634.626.5333.603.0933.413.970.815IND_06733.513.5633.603.0933.413.970.815IND_068154.5914.15153.4313.20155.7614.960.004IND_06974.376.9174.047.6374.706.080.009IND_06964.5166.7166.716.8325.676.01	IND_052	45.47	4.28	45.41	4.10	45.54	4.47	0.903
IND_054I19.967.21.092.798.04147.341004.600.005IND_05570.148.0269.517.2270.778.710.025IND_05611.292.4821.241.8821.342.960.455IND_05739.605.6940.943.3338.267.080.000IND_05898.556.9099.076.7198.027.050.004IND_0592.156.511.932.492.378.870.218IND_06026.444.0825.862.7527.025.010.000IND_06137.056.2737.374.0136.737.900.000IND_06231.716.0132.023.7431.417.620.000IND_06343.385.1644.723.0942.036.340.000IND_06476.9611.9081.4310.4172.4811.620.000IND_06565.8811.0069.809.7661.9610.780.000IND_06634.626.5334.056.0035.206.980.002IND_065154.5914.15153.4313.20155.7614.960.004IND_068154.5914.15153.4313.20155.766.010.005IND_06974.376.9174.047.6374.706.080.009IND_07026.196.4526.716.8325.676.01 </td <td>IND_053</td> <td>50.59</td> <td>4.95</td> <td>50.56</td> <td>4.70</td> <td>50.63</td> <td>5.19</td> <td>0.772</td>	IND_053	50.59	4.95	50.56	4.70	50.63	5.19	0.772
IND_0561.121.11 <th< td=""><td>IND 055</td><td>70.14</td><td>8.02</td><td>69.51</td><td>7 22</td><td>70 77</td><td>8 71</td><td>0.000</td></th<>	IND 055	70.14	8.02	69.51	7 22	70 77	8 71	0.000
ND<05739.605.6940.943.3338.267.080.00IND_05898.556.9099.076.7198.027.050.004IND_0592.156.511.932.492.378.870.218IND_06026.444.0825.862.7527.025.010.000IND_06137.056.2737.374.0136.737.900.000IND_06231.716.0132.023.7431.417.620.000IND_06343.385.1644.723.0942.036.340.000IND_06476.9611.9081.4310.4172.4811.620.000IND_06565.8811.0069.809.7661.9610.780.000IND_06634.626.5334.056.0035.206.980.002IND_06733.513.5633.603.0933.413.970.815IND_068154.5914.15153.4313.20155.7614.960.009IND_06974.376.9174.047.6374.706.080.009IND_07026.196.4526.716.8325.676.010.005	IND 056	21.29	2.48	21.24	1.88	21.34	2.96	0.455
IND_05898.556.9099.076.7198.027.050.004IND_0592.156.511.932.492.378.870.218IND_06026.444.0825.862.7527.025.010.000IND_06137.056.2737.374.0136.737.900.001IND_06231.716.0132.023.7431.417.620.000IND_06343.385.1644.723.0942.036.340.000IND_06476.9611.9081.4310.4172.4811.620.000IND_06565.8811.0069.809.7661.9610.780.002IND_06634.626.5334.056.0035.206.980.002IND_06733.513.5633.603.0933.413.970.815IND_068154.5914.15153.4313.20155.7614.960.009IND_06974.376.9174.047.6374.706.080.009IND_07026.196.4526.716.8325.676.010.005	IND_057	39.60	5.69	40.94	3.33	38.26	7.08	0.000
IND_0592.156.511.932.492.378.870.218IND_06026.444.0825.862.7527.025.010.000IND_06137.056.2737.374.0136.737.900.000IND_06231.716.0132.023.7431.417.620.000IND_06343.385.1644.723.0942.036.340.000IND_06476.9611.9081.4310.4172.4811.620.000IND_06565.8811.0069.809.7661.9610.780.002IND_06634.626.5334.056.0035.206.980.002IND_06733.513.5633.603.0933.413.970.815IND_068154.5914.15153.4313.20155.7614.960.009IND_06974.376.9174.047.6374.706.080.009IND_07026.196.4526.716.8325.676.010.005	IND_058	98.55	6.90	99.07	6.71	98.02	7.05	0.004
IND_06026.444.0825.862.7527.025.010.000IND_06137.056.2737.374.0136.737.900.000IND_06231.716.0132.023.7431.417.620.000IND_06343.385.1644.723.0942.036.340.000IND_06476.9611.9081.4310.4172.4811.620.000IND_06565.8811.0069.809.7661.9610.780.002IND_06634.626.5334.056.0035.206.980.002IND_06733.513.5633.603.0933.413.970.815IND_068154.5914.15153.4313.20155.7614.960.009IND_06974.376.9174.047.6374.706.080.009IND_07026.196.4526.716.8325.676.010.005	IND_059	2.15	6.51	1.93	2.49	2.37	8.87	0.218
IND_06137.056.2737.374.0136.737.900.000IND_06231.716.0132.023.7431.417.620.000IND_06343.385.1644.723.0942.036.340.000IND_06476.9611.9081.4310.4172.4811.620.000IND_06565.8811.0069.809.7661.9610.780.000IND_06634.626.5334.056.0035.206.980.002IND_06733.513.5633.603.0933.413.970.815IND_068154.5914.15153.4313.20155.7614.960.004IND_06974.376.9174.047.6374.706.080.002IND_07026.196.4526.716.8325.676.010.005	IND_060	26.44	4.08	25.86	2.75	27.02	5.01	0.000
IND_06231.716.0132.023.7431.417.620.000IND_06343.385.1644.723.0942.036.340.000IND_06476.9611.9081.4310.4172.4811.620.000IND_06565.8811.0069.809.7661.9610.780.000IND_06634.626.5334.056.0035.206.980.002IND_06733.513.5633.603.0933.413.970.815IND_068154.5914.15153.4313.20155.7614.960.004IND_06974.376.9174.047.6374.706.080.005IND_07026.196.4526.716.8325.676.010.005	IND_061	37.05	6.27	37.37	4.01	36.73	7.90	0.000
IND_00343.385.1644.723.0942.036.340.000IND_06476.9611.9081.4310.4172.4811.620.000IND_06565.8811.0069.809.7661.9610.780.000IND_06634.626.5334.056.0035.206.980.002IND_06733.513.5633.603.0933.413.970.815IND_068154.5914.15153.4313.20155.7614.960.004IND_06974.376.9174.047.6374.706.080.009IND_07026.196.4526.716.8325.676.010.005	IND_062	31.71	6.01	32.02	3.74	31.41	7.62	0.000
IND_00470.5011.5081.4310.4172.4811.620.000IND_06565.8811.0069.809.7661.9610.780.000IND_06634.626.5334.056.0035.206.980.002IND_06733.513.5633.603.0933.413.970.815IND_068154.5914.15153.4313.20155.7614.960.004IND_06974.376.9174.047.6374.706.080.009IND_07026.196.4526.716.8325.676.010.005	IND_063	43.38	5.16	44.72	3.09	42.03	6.34 11.60	0.000
IND_00503.8511.0009.809.7601.9610.780.000IND_06634.626.5334.056.0035.206.980.002IND_06733.513.5633.603.0933.413.970.815IND_068154.5914.15153.4313.20155.7614.960.004IND_06974.376.9174.047.6374.706.080.009IND_07026.196.4526.716.8325.676.010.005	IND_065	/0.90 65 99	11.90	81.43	10.41	/ 2.48	11.02	0.000
IND_067     33.51     3.56     36.00     33.41     3.97     0.815       IND_068     154.59     14.15     153.43     13.20     155.76     14.96     0.002       IND_069     74.37     6.91     74.04     7.63     74.70     6.08     0.009       IND_070     26.19     6.45     26.71     6.83     25.67     6.01     0.005	IND 066	00.00	6.52	09.80 34.05	9.70	35 20	10.78	0.000
IND_068     154.59     14.15     153.43     13.20     155.76     14.96     0.004       IND_069     74.37     6.91     74.04     7.63     74.70     6.08     0.009       IND_070     26.19     6.45     26.71     6.83     25.67     6.01     0.005	IND 067	33 51	3.56	33.60	3.09	33.41	3 97	0.815
IND_069     74.37     6.91     74.04     7.63     74.70     6.08     0.009       IND_070     26.19     6.45     26.71     6.83     25.67     6.01     0.005	IND 068	154.59	14.15	153.43	13.20	155.76	14.96	0.004
IND_070 26.19 6.45 26.71 6.83 25.67 6.01 0.005	IND_069	74.37	6.91	74.04	7.63	74.70	6.08	0.009
	IND_070	26.19	6.45	26.71	6.83	25.67	6.01	0.005

(continued on next page)

# Table 4 (continued)

Variables	Total		Sex							
			Female		Male					
	Mean	SD	Mean	SD	Mean	SD				
IND 071	36.08	11.37	36.88	11.32	35 27	11.37	0.005			
IND_072	56.01	16.37	54.94	17.70	57.07	14.85	0.000			
IND_073	96.36	2.79	96.95	2.53	95.77	2.92	0.000			
IND_074	91.53	3.38	91.10	3.21	91.95	3.49	0.000			
IND_075	105.46	5.55	106.58	5.22	104.33	5.65	0.000			
IND_076	98.14	10.80	97.77	7.99	98.52	13.02	0.553			
IND_077	26.68	4.82	25.48	3.99	27.88	5.27	0.000			
IND_078	2.07	2.29	1.99	2.33	2.15	2.25	0.062			
IND_079	34.59	5.01	34.62	3.5/	34.50	0.13	0.087			
IND_080	34 33	9.52	29.44	3.29	32.28	12.92	0.000			
IND_082	51.02	16.78	50.94	8 46	51.10	22.19	0.820			
IND 083	44.52	8.08	41.95	6.60	47.11	8.58	0.000			
IND_084	52.23	10.00	49.11	8.34	55.35	10.55	0.000			
IND_085	93.13	8.49	94.44	7.92	91.81	8.84	0.000			
IND_086	26.64	2.09	27.20	1.78	26.08	2.23	0.000			
IND_087	108.03	719.45	82.39	7.15	133.82	1018.67	0.000			
IND_088	61.93	5.42	61.65	4.95	62.22	5.84	0.284			
IND_089	16.43	1.52	16.59	1.47	16.27	1.55	0.001			
IND_090	6.69	1.02	6.86	0.96	6.52	1.04	0.000			
IND_091	8.03	1.07	8.08	1.03	7.98	1.11	0.087			
IND_092	39.74	4.01	39.04	3.15	40.43 21.65	4.61	0.000			
IND_093 IND_094	33.04	3.50	33.12	2.14	31.05	4.00	0.002			
IND 095	37.92	6.75	38.94	4.97	36.89	8.02	0.000			
IND 096	110.31	13.58	108.91	11.90	111.71	14.95	0.001			
IND_097	138.22	15.86	144.17	12.74	132.26	16.44	0.000			
IND_098	41.37	2.79	41.54	2.54	41.19	3.01	0.003			
IND_099	93.09	13.38	97.94	11.78	88.23	13.13	0.000			
IND_100	43.25	4.05	44.32	3.58	42.16	4.21	0.000			
IND_101	13.22	0.77	13.30	0.72	13.13	0.81	0.000			
IND_102	36.68	3.26	37.00	3.31	36.36	3.19	0.000			
IND_103	28.04	2.96	27.70	2.56	28.37	3.28	0.000			
IND_104	18.45	1.36	18.59	1.23	18.30	1.47	0.000			
IND_105	21.00	0.93	11.28	0.72	10.73	1.02	0.000			
IND_100 IND 107	88 95	8.73	32.04 89 32	8.96	88 57	8.48	0.084			
IND 108	67.94	7.32	66.82	6.28	69.07	8.08	0.000			
IND 109	44.69	3.23	44.84	3.02	44.53	3.43	0.093			
IND_110	26.64	2.09	27.20	1.78	26.08	2.23	0.000			
IR_01	11.53	1.57	11.49	1.62	11.56	1.51	0.001			
IR_02	9.63	1.06	9.42	0.75	9.84	1.26	0.000			
IR_03	7.59	0.45	7.54	0.42	7.64	0.47	0.000			
IR_04	2.75	0.25	2.73	0.25	2.77	0.26	0.000			
IR_05	6.22	0.35	6.18	0.32	6.26	0.37	0.000			
IR_06	4.25	0.37	4.18	0.32	4.32	0.40	0.000			
IR_07	5.23	0.38	5.18	0.34	5.28	0.40	0.000			
IR_08 IR_00	2.43	0.16	2.42	0.15	2.44	0.17	0.003			
IK_09 IR 10	5.02 1.64	0.54	2.94	0.20	1.69	0.39	0.000			
IR 11	1.67	0.53	1.60	0.15	1.05	0.73	0.000			
IR 12	0.11	0.36	0.10	0.13	0.13	0.50	0.114			
IR_13	3.94	0.36	3.94	0.32	3.95	0.39	0.335			
IR_14	1.05	0.21	1.00	0.17	1.10	0.23	0.000			
IR_15	2.02	0.20	2.00	0.17	2.04	0.21	0.000			
IR_16	2.07	0.22	2.06	0.20	2.08	0.23	0.010			
IR_17	1.98	0.18	1.97	0.16	1.98	0.20	0.261			
IR_18	1.98	0.18	1.98	0.16	1.98	0.20	0.327			
IR_19	2.16	0.20	2.17	0.19	2.15	0.21	0.449			
IR_20	2.15	0.20	2.16	0.18	2.14	0.21	0.434			
IR_21 IR_20	1.40	0.64	1.31	0.22	1.48	0.87	0.000			
IR_22 IR_22	0.89	0.13	0.87	0.12	0.92	0.13	0.000			
IR 24	5.11	0.53	5.11	0.37	5.11	0.66	0.271			
IR 25	6.48	0.48	6.42	0.43	6.53	0.52	0.000			
IR_26	6.95	0.48	6.88	0.42	7.02	0.52	0.000			
IR_27	7.83	0.55	7.75	0.49	7.91	0.59	0.000			
IR_28	10.65	0.90	10.38	0.63	10.92	1.04	0.000			
IR_29	0.61	0.09	0.61	0.08	0.61	0.09	0.899			
IR_30	4.22	0.53	4.25	0.33	4.19	0.67	0.000			
IR_31	5.59	0.42	5.55	0.38	5.62	0.45	0.001			
IR_32	6.06	0.42	6.01	0.37	6.11	0.46	0.000			
IR_33	6.94	0.49	6.88	0.45	7.00	0.53	0.000			

Table 5

#### Table 4 (continued)

Variables	ables Total		Sex				р
			Female		Male		
	Mean	SD	Mean	SD	Mean	SD	
IR_34	9.77	0.89	9.51	0.58	10.02	1.06	0.000
IR_35	3.61	0.55	3.64	0.33	3.59	0.70	0.000
IR_36	4.98	0.41	4.95	0.37	5.01	0.44	0.001
IR_37	5.45	0.40	5.40	0.36	5.50	0.43	0.000
IR_38	6.33	0.48	6.27	0.43	6.39	0.51	0.000
IR_39	9.16	0.92	8.90	0.56	9.42	1.11	0.000
IR_40	1.40	0.64	1.31	0.22	1.48	0.87	0.000
IR_41	1.87	0.64	1.77	0.22	1.97	0.87	0.000
IR_42	2.75	0.67	2.64	0.29	2.86	0.89	0.000
IR_43	5.61	1.33	5.27	0.49	5.95	1.75	0.000
IR_44	0.49	0.13	0.47	0.14	0.50	0.13	0.000
IR_45	1.36	0.25	1.34	0.23	1.38	0.27	0.001
IR_46	4.23	1.29	3.96	0.42	4.50	1.74	0.000
IR_47	0.88	0.17	0.88	0.16	0.89	0.18	0.095
IR_48	3.76	1.31	3.50	0.36	4.02	1.79	0.000
IR_49	2.89	1.41	2.63	0.36	3.14	1.93	0.000
IR_50	-0.10	0.12	-0.14	0.11	-0.06	0.11	0.000

p: Mann-Whitney test outcomes considering a significance level of 5%.

Factors	that	influence	on	disting	uishing	females	aged	above	14	and	18	years.

Variables	>14 year	s					>18 years						
	β	β Pad.	SE	OR	CI - 95 %	р	β	β Pad.	SE	OR	CI - 95 %	р	
Intercept	25.01	15.33	5.43	-	-	0.000	13.78	-2.27	5.65	-	-	0.015	
IND_002	-0.09	-0.09	0.02	0.91	[0.87; 0.95]	0.000	-	-	-	-	-	-	
IND_048	-0.12	-0.05	0.05	0.89	[0.80; 0.99]	0.031	-0.14	-0.12	0.05	0.87	[0.79; 0.95]	0.002	
IND_050	-0.03	-0.03	0.01	0.97	[0.94; 0.99]	0.005	-0.04	-0.03	0.01	0.96	[0.94; 0.98]	0.000	
IND_059	0.21	0.11	0.07	1.23	[1.08; 1.41]	0.002	0.22	0.15	0.05	1.25	[1.12; 1.39]	0.000	
IND_072	0.02	0.01	0.01	1.02	[1.00; 1.03]	0.009	-	-	-	-	-	-	
IND_077	0.06	0.03	0.02	1.06	[1.01; 1.11]	0.014	-	-	-	-	-	-	
IND_078	-0.11	-0.09	0.06	0.90	[0.80; 1.00]	0.048	-0.16	-0.07	0.05	0.85	[0.76; 0.95]	0.003	
IND_082	-0.05	-0.03	0.02	0.95	[0.92; 0.98]	0.001	0.03	0.03	0.01	1.03	[1.00; 1.05]	0.024	
IND_091	-0.34	-0.30	0.10	0.71	[0.58; 0.88]	0.001	-	-	-	-	-	-	
IND_097	-0.03	-0.03	0.01	0.97	[0.95; 0.98]	0.000	-	-	-	-	-	-	
IND_102	-0.10	-0.09	0.04	0.90	[0.84; 0.97]	0.007	-	-	-	-	-	-	
IR_11	-2.06	-0.21	0.84	0.13	[0.02; 0.67]	0.015	-3.32	-1.04	0.77	0.04	[0.01; 0.16]	0.000	
IR_23	5.20	6.69	1.16	181.99	[18.85; 1757.10]	0.000	-	-	-	-	-	-	
IND_029	-	-	-	-	-	-	0.07	0.08	0.01	1.07	[1.04; 1.10]	0.000	
IND_058	-	-	-	-	-	-	-0.03	0.00	0.01	0.97	[0.94; 0.99]	0.015	
IND_073	-	-	-	-	-	-	-0.09	-0.03	0.04	0.91	[0.84; 0.98]	0.017	
IR_01	-	-	-	-	-	-	0.13	0.04	0.06	1.14	[1.02; 1.27]	0.020	
IR_22	-	-	-	-	-	-	3.96	3.60	0.92	52.34	[8.58; 319.28]	0.000	
R <sup>2</sup> (Negelker	rke)				22.88 %		19.90 %						
Hosmer-Lem	eshow (p-val	lue)			0.514		0.494						
Area Under t	the Curve (A	UC)			0.76		0.73						
Sensibility					0.75		0.75						
Specificity					0.65		0.61						

SE: standard error; OR: Odds Ratio; CI: confidence interval.

threshold of 18. In both age thresholds, the outcomes for males were more accurate than those for females. The difference between females and males may be justified by the development timing. In particular, the facial development in females is limited to a shorter age interval, in which a developmental slowdown is evident around the age of 13. In males, the developmental process extends throughout the adolescence up to the early adulthood [18]. In practice, the continuous and accumulative morphological changes in the human face with age culminate in more accurate estimates of the model for males for both the legal age thresholds of 14 and 18.

In the scientific literature, higher accuracy rates were previously (and recently) reported from estimating age using photoanthropometric analyses. Authors used Joint Mutual Information (JMI) calculated from morphological changes in the human face to distinguish participants that were younger or older than 10, 14 and 18 years. By means of ROC curve analysis they obtained accuracy rates of 0.971, 0.969 and 0.903,

respectively [6]. The reduced accuracy rates obtained in the present study is justified, firstly, by the development of two logistic regression models for each age threshold – one for females and one for males. In the previous study, the authors did not designed models specifically based on sex. It is estimated that their mean accuracy rate would decrease nearly 22 % by splitting their model for females and males. A second factor that also played an important part in the present study is the sample selection based on the ancestry of the participants – which were all Caucasian Brazilians with European ancestry. In the previous study, sampling strategies based on (uniform) ancestry were not applied.

The accuracy of an age estimation method that is designed to make forensic inferences related to the age threshold of 14 and 18 is extremely relevant for application in practice. Lack of justice and wrongful convictions are the consequence of incorrectly classifying crime victims and perpetrators based on age [19]. From a forensic point of view, there are two main types of errors that may occur from the application of a



Fig. 2. Receiver Operating Characteristics curve (ROC) outcomes of the statistic model designed to distinguish females aged >14 years.

AUC = 0.73 Sensitivity = 0.75 Specificity = 0,61



잁

8

0,6

Sensitivity

Fig. 3. Receiver Operating Characteristics curve (ROC) outcomes of the statistic model designed to distinguish females aged >18 years.

specific technical expertise: false positives and false negatives. In the context of the present study, the first is translated as those participants that were younger than 14 or 18 and were classified above these age thresholds. In practice, false positives will induce a less severe judgment of perpetrators because the victims were classified above the age of sexual consent. On the other hand, false negatives represent the participants that were classified below the age of legal consent (<14) and age of majority (<18) when in fact they were older. In these cases, the judgment of perpetrators is more severe because of their sexual involvement with minors. In the worst scenario, the false negative outcomes may lead to the conviction of an innocent based on the crime of child pornography. In the present study, false negatives among females reached 25 % for both the age threshold of 14 and 18, while in males it reached 19% and 16% for the ages of 14 and 18, respectively.

The present study was innovative because it resulted in outcomes from a large and standardized database. The photoanthropometric analysis of the human face figured as an available tool for studying the morphological alterations that occur in females and males and their relation with the legal age threshold of 14 and 18 years. In females, the accuracy of this method reached 76 % (for the threshold of 14) and 73 % (for the threshold of 18), while in males it reached 90 % and 83 % for the age threshold of 14 and 18, respectively. Future studies in the Field should investigate the facial morphological changes over the time in different populations - especially because sexually dimorphic features may be influenced by internal and external factors, such as socioeconomic status [20], nutrition and hormonal behavior. Forensic experts must understand that the application of the present technique and findings may be extrapolated toward needs other than the analysis of pedo-pornographic material. For instance, it may provide knowledge to understand how males and females differ based on facial traits (sexual dimorphism), and to point out possible facial age progression of persons reported missing for a long time. Studies dedicated to clarify the application of the technique to these fields are encouraged.

#### Table 6

Factors that influence on distir	guishing males age	d above 14 and	18 years
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Variables	> 14 years						> 18 years					
	β	$\beta$ Pad.	SE	OR	CI - 95 %	р	β	$\beta$ Pad.	SE	OR	CI - 95 %	р
Intercept	-14.06	-2.21	4.68	-	-	0.003	-31.82	-14.72	3.63	-	-	0.000
IND_022	-0.04	-0.05	0.01	0.96	[0.94; 0.98]	0.001	-	5.66	-	-	-	-
IND_073	0.14	0.03	0.04	1.15	[1.06; 1.26]	0.001	-	-	-	-	-	-
IND_091	0.43	0.31	0.11	1.53	[1.23; 1.90]	0.000	-	-	-	-	-	-
IND_097	-0.11	-0.06	0.01	0.90	[0.88; 0.92]	0.000	-	-	-	-	-	-
IR_10	5.92	3.83	0.93	373.73	[60.37; 2313.68]	0.000	-	-	-	-	-	-
IR_22	8.62	6.33	1.10	5540.78	[641.12; 47884.94]	0.000	6.70	5.66	0.97	812.14	[121.33; 5436.02]	0.000
IR_49	-0.48	-0.24	0.09	0.62	[0.51; 0.74]	0.000	-		-	-	-	-
IND_006	-	-	-	-	-	-	0.13	0.09	0.02	1.14	[1.09; 1.19]	0.000
IND_050	-	-	-	-	-	-	-0.02	-0.03	0.01	0.98	[0.96; 0.99]	0.009
IND_058	-	-	-	-	-	-	0.06	0.01	0.02	1.06	[1.03; 1.10]	0.000
IND_059	-	-	-	-	-	-	0.12	0.09	0.05	1.13	[1.03; 1.24]	0.010
IND_072	-	-	-	-	-	-	0.02	0.01	0.01	1.02	[1.01; 1.04]	0.004
IND_084	-	-	-	-	-	-	0.07	0.05	0.01	1.08	[1.05; 1.10]	0.000
IND_091	-	-	-	-	-	-	0.26	0.14	0.12	1.30	[1.02; 1.65]	0.033
IR_01	-	-	-	-	-	-	-0.20	0.05	0.09	0.82	[0.69; 0.97]	0.024
IR_11	-	-	-	-	-	-	3.59	-0.11	0.78	36.30	[7.81; 168.81]	0.000
IR_50	-	-	-	-	-	-	-2.39	-1.59	1.24	0.09	[0.01; 1.03]	0.053
R <sup>2</sup> (Negelker	ke)				54.84 %		40.52 %					
Hosmer-Leme	eshow (p-valu	1e)			0.289		0.122					
Area Under t	he Curve (AU	JC)			0.90		0.83					
Sensibility					0.81		0.84					
Specificity					0.85		0.69					

SE: standard error; OR: Odds Ratio; CI: confidence interval.



Fig. 4. Receiver Operating Characteristics curve (ROC) outcomes of the statistic model designed to distinguish males aged >14 years.



Fig. 5. Receiver Operating Characteristics curve (ROC) outcomes of the statistic model designed to distinguish males aged >18 years.

### Compliance with ethical standards

Ethical approval from the Institutional Committee of Ethics in Human Research was obtained for this study (protocol: CAAE-51448515.0.3002.0075), and properly included aspects related with informed consent.

## **Declaration of Competing Interest**

The authors report no declarations of interest.

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## Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.fsir.2020.100131.

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