

# RESEARCH NEWSLETTER

RESEARCH CELL,  
2<sup>ND</sup> FLOOR, PHARMACY BUILDING,  
SUMANDEEP VIDYAPEETH

ISSUE 6

NOV., 2017  
TO JAN., 2018

It is our pleasure to release the 6<sup>th</sup> issue of Research Newsletter. The theme of the present issue is “Biostatistics and its role in Research”

Biostatistics has played an indispensable role in all sort of biomedical research from sample size to data analysis in order to confirm the hypothesis. Biostatistics is also used to determine how diseases develop, progress and spread.

Research Cell aims to nurture research ecosystem in all constituent institutes through various research updates and discussion with faculty & researchers of Sumandeep Vidyapeeth. Research Cell believes that students, faculty and clinicians should come forward with hypothesis based research project.

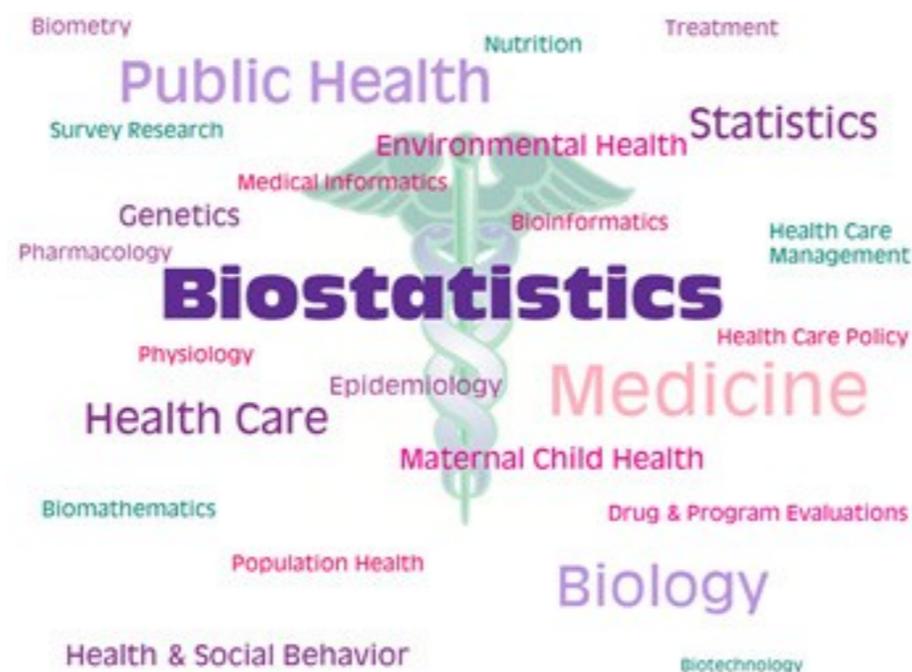
Research Cell feels that this issue of Newsletter will update the faculty and researchers with regard to its activity and research design. Suggestions are always welcome to make this communication more meaningful.

- Director Research



*“Research is what everybody has seen and to think what no body has thought.”*

- (Albert Szent Gyorgyi)



*Statistics play a crucial role in clinical trials and in the drug development process – from trial design to protocol development. Having a fundamental understanding of statistical issues can uphold the integrity of a clinical trial and improve communication.*

### Biostatistician Role

- ⇒ Protocol development
- ⇒ Data management
- ⇒ Study implementation
- ⇒ Data analysis
- ⇒ Report/manuscript writing

W. A. Walls defined Statistics as a body of methods for making wise decisions in the face of uncertainty.

According to Merriam-Webster, Biostatistics is defined as an innovative field that involves statistical processes and methods applied for the collection, analysis, and interpretation of biological data and especially data relating to human biology, public health, and medicine.

## ROLE OF BIOSTATISTICS IN HEALTHCARE RESEARCH

- \* Statistical methods and analyses are often used to communicate research findings and to support hypothesis and give credibility to research methodology and conclusions.
- \* Understanding of biostatistics allows the researcher to evaluate the ultimate usefulness of the information and make appropriate decisions.

Why is statistics necessary in medicine?

**STATISTICS IN BIOMEDICAL RESEARCH**

ARBOR Ciencia, Pensamiento y Cultura  
CLXXXIII 725 mayo-junio (2007) 353-361 ISSN: 0210-1963

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*RESUMEN:* La Bioestadística es hoy en día una componente científica fundamental de la investigación en Biomedicina, salud pública y servicios de salud. Las áreas tradicionales y emergentes de aplicación incluyen ensayos clínicos, estudios observacionales, fisiología, imágenes, y genómica. Este artículo repasa la situación actual de la Bioestadística, considerando los métodos estadísticos usados tradicionalmente en in-

*ABSTRACT:* The discipline of biostatistics is nowadays a fundamental scientific component of biomedical, public health and health services research. Traditional and emerging areas of application include clinical trials research, observational studies, physiology, imaging, and genomics. The present article reviews the current situation of biostatistics, considering the statistical methods traditionally used

<http://arbor.revistas.csic.es/index.php/arbor/article/viewFile/108/109&a=bi&pagenumber=1&w=100>

## APPLICATIONS

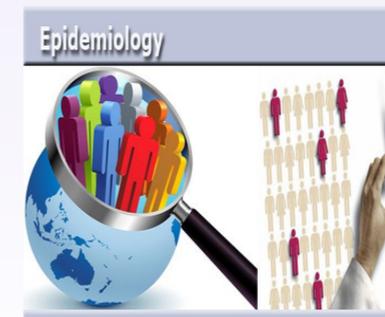
Clinical Research



Basic science and laboratory research



Epidemiological Research



## Application of biostatistics in research by teaching faculty and final-year postgraduate students in colleges of modern medicine: A cross-sectional study

AD Gore, YR Kadam, PV Chavan, and GB Dhumale  
Author information | Copyright and License information |

This article has been cited by other articles in PMC.

Go to:

### Abstract

#### Context:

Biostatistics is well recognized as an essential tool in medical research, clinical decision making and health management. Deficient basic biostatistical knowledge adversely affects research quality. Surveys on this issue are uncommon in the literature.

#### Aims:

To study the use of biostatistics in research by teaching faculty and final-year postgraduate students in colleges of modern medicine.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3657982/>

## 13. Study design and choosing a statistical test

### Design

In many ways the design of a study is more important than the analysis. A badly designed study can never be retrieved, whereas a poorly analysed one can usually be reanalysed. (1) Consideration of design is also important because the design of a study will govern how the data are to be analysed.

Most medical studies consider an input, which may be a medical intervention or exposure to a potentially toxic compound, and an output, which is some measure of health that the intervention is supposed to affect. The simplest way to categorise studies is with reference to the time sequence in which the input and output are studied.

The most powerful studies are prospective studies, and the paradigm for these is the randomised controlled trial. In this subjects with a disease are randomised to one of two (or more) treatments, one of which may be a control treatment. Methods of randomisation have been described in Chapter 3. The importance of randomisation is that we know in the long run treatment groups will be balanced in known and unknown prognostic factors. It is important that the treatments are concurrent - that the active and control treatments occur in the same period of time.

<http://www.bmj.com/about-bmj/resources-readers/publications/statistics-square-one/13-study-design-and-choosing-statistical-test>

# Role of Biostatistics in Medical Research

## RESEARCH ARTICLE The health belief model and number of peers with internet addiction as inter-related factors of Internet addiction among secondary school students in Hong Kong

Yanhong Wang<sup>1</sup>, Anise M. S. Wu<sup>2</sup> and Joseph T. F. Lau<sup>1\*</sup>

**Abstract**  
Background: Students are vulnerable to internet addiction (IA). Influences of cognitions based on the Health Belief Model (HBM) and perceived number of peers with IA (PNPIA) affecting students' IA, and mediating effects involved.

**Statistical analysis**  
The dependent variable was probable IA, defined as having a CIAS score >63 [63]. Chi-square test and t-test were used to compare between-group gender differences on all independent variables (including socio-demographic factors, HBM constructs, and PNPIA), and separate analyses were conducted for males and females. Spearman correlation coefficients between PNPIA and the significant scales that concurred with the HBM were presented. Univariate odds ratios (ORu) were firstly derived for all independent variables. Adjusted odds ratios (ORa) were then obtained for the HBM constructs and PNPIA by fitting multiple logistic regression models, adjusted for all socio-demographic variables that were found to be statistically significant ( $p < 0.05$ ) in the univariate analysis. Lastly, a multiple logistic regression model was fit to derive multivariate odds ratios (ORM) by entering PNPIA and those scales that were significantly associated with IA and concurred with the HBM into the same model. The model was also adjusted for socio-demographic variables that were found to be statistically significant in the univariate analysis. Respective 95 % confidence intervals (CI) were derived for all odds ratios presented in the report. Statistical significance was defined as  $p < 0.05$  and all analyses were conducted by using SAS 9.2 (SAS Institute, Cary, NC, USA).

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## Severe non-traumatic bleeding events detected by computed tomography: do anticoagulants and antiplatelet agents have a role?

### Statistical analyses

The statistics were computed using STATA V10 software (Stata Corp, College USA). Data are expressed as frequencies and associated percentages for categorical means  $\pm$  standard deviations for continuous data.

The categorical data from the two treatment groups were compared using the (or Fisher's exact test, if necessary). Continuous data were compared using the Kruskal-Wallis test, if necessary, normality was verified by the Shapiro-Wilk test, homoscedasticity by the Fisher-Snedecor test.

The risk ratio, for patients who received AC or APA, for a cerebral hemorrhage, cerebral herniation, a rectus sheath, iliopsoas bleeding, or a quadriceps hematoma with their corresponding 95% confidence intervals.

All tests were two-sided, with the type 1 error set at  $\alpha = 0.05$ .

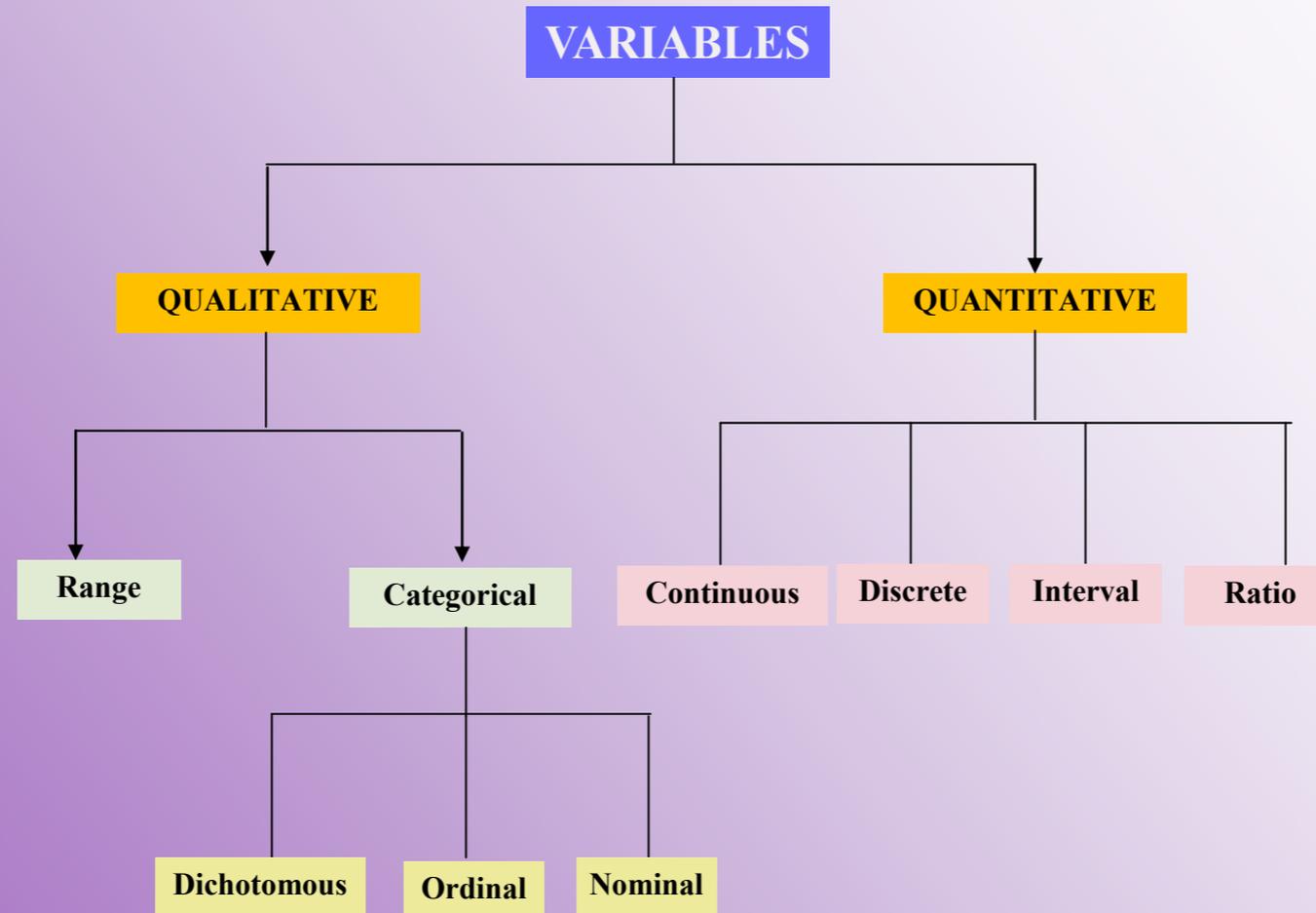
## TYPES OF BIOSTATISTICS

1. **Descriptive Statistics:** It describes the relationship between variables

2. **Inferential Statistics:** It makes inferences about the population, based on random sample

## VARIABLES

All experiments examine some kind of variable (s). A variable is not only something that we measure, but also something that we can manipulate and something we can control for.



### 1. Dichotomous variable:

Dichotomous variables are nominal variables which have only two categories or levels.

For example, if we were looking at gender, we would most probably categorize somebody as either "male" or "female".

## 2. Ordinal variable :

Ordinal variables are variables that have two or more categories just like nominal variables only the categories can also be ordered or ranked.

So if you asked someone if they liked the policies of the Democratic Party and they could answer either "Not very much", "They are OK" or "Yes, a lot" then you have an ordinal variable.

## 3. Nominal variable :

Nominal variables are variables that have two or more categories, but which do not have an intrinsic order.

For example, a real estate agent could classify their types of property into distinct categories such as houses, condos, co-ops or bungalows. So "type of property" is a nominal variable with 4 categories called houses, condos, co-ops and bungalows.

## 4. Range :

Range is defined simply as the difference between the maximum and minimum observations.

For example, In  $\{4, 6, 9, 3, 7\}$  the lowest value is 3, and the highest is 9, so the range is  $9 - 3 = 6$ .

## 5. Continuous variable :

Continuous variables are numeric variables that have an infinite number of values between any two values. A continuous variable can be numeric or date/time.

For example, the length of a part or the date and time a payment is received.

## 6. Discrete variable :

Discrete variables are numeric variables that have a countable number of values between any two values. A discrete variable is always numeric.

For example, the number of customer complaints or the number of flaws or defects.

## 7. Interval variable :

Interval variables are variables for which their central characteristic is that they can be measured along a continuum and they have a numerical value

For example, the number of customer complaints or the number of flaws or defects. So the difference between 20C and 30C is the same as 30C to 40C. However, temperature measured in degrees Celsius or Fahrenheit is NOT a ratio variable.

## 8. Ratio variable :

Ratio variables are interval variables, but with the added condition that 0 (zero) of the measurement indicates that there is none of that variable. The name "ratio" reflects the fact that you can use the ratio of measurements.

For example, a distance of ten meters is twice the distance of 5 meters.

## Upcoming Workshops on Statistics

1. Workshop on multivariate regression modeling  
**Date:** 26-30 March, 2018  
**Venue:** Department of Statistics, HIMS, Swami Rama Himalayan University, Uttarakhand



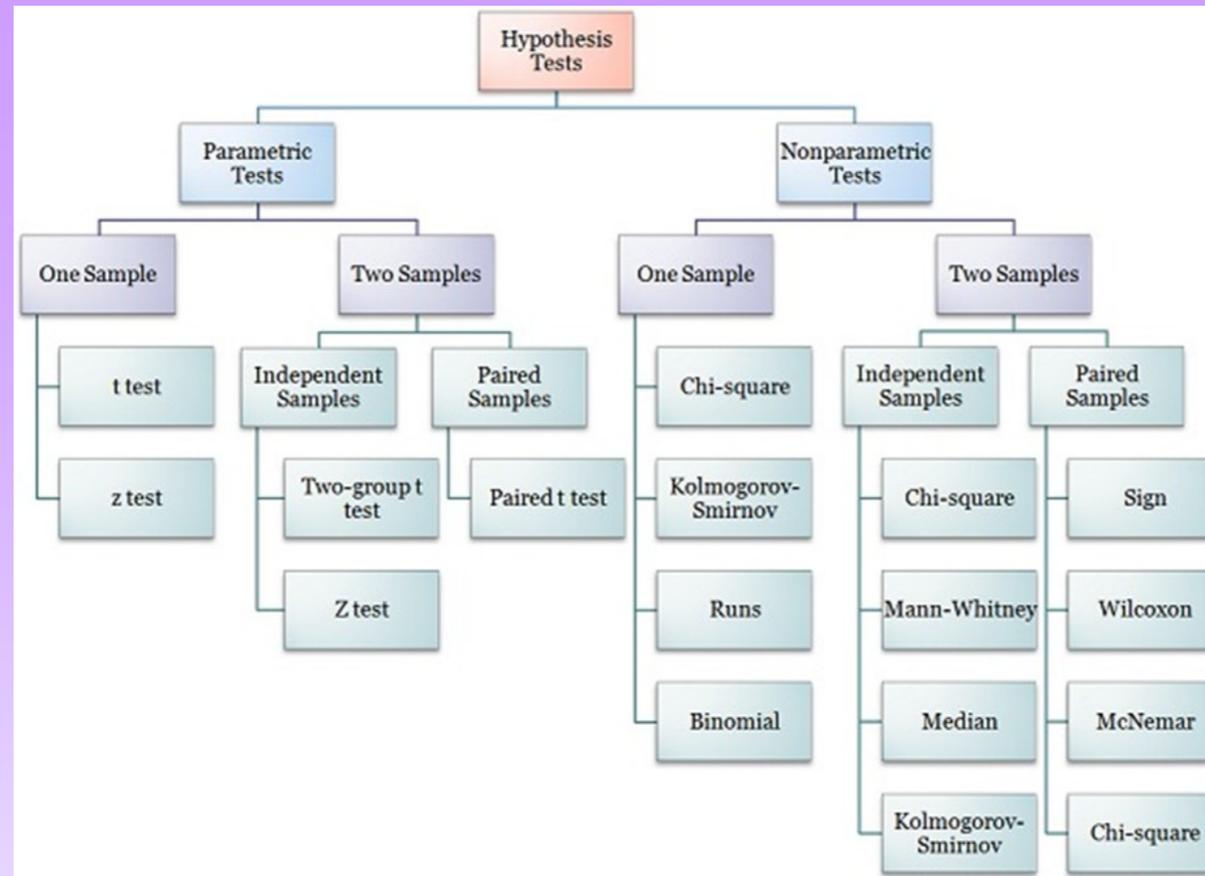
2. Workshop on Statistical Modeling using Health Data  
**Date:** 23-27 April, 2018  
**Venue:** Department of Statistics, HIMS, Swami Rama Himalayan University, Uttarakhand



### HYPOTHETICAL TEST

- ♦ To make the generalization about the population from the sample, statistical tests are used. A statistical test is a formal technique that relies on the probability distribution, for reaching the conclusion concerning the reasonableness of the hypothesis. These hypothetical testing related to differences are classified as parametric and nonparametric tests. The **parametric test** is one which has information about the population parameter. On the other hand, the **nonparametric test** is one where the researcher has no idea regarding the population parameter.
- ♦ The parametric test is the hypothesis test which provides generalizations for making statements about the mean of the parent population.
- ♦ The nonparametric test is defined as the hypothesis test which is not based on underlying assumptions, i.e. it does not require population's distribution to be denoted by specific parameters.

## TYPES OF HYPOTHETICAL TEST



### Difference between Parametric and Non - Parametric Test

	Parametric	Non Parametric
<b>Distribution</b>	Normal/Gaussian	Any
<b>Assumed Variance</b>	Homogeneous	Any
<b>Type of Data</b>	Quantitative	Qualitative
<b>Data Set Relationship</b>	Independent	Any
<b>Measure of Central Tendency</b>	Mean	Median
<b>Correlation Test</b>	Pearson	Spearman
<b>Independent Measures, 1 Condition, 2 Group</b>	Independent t test	Mann-Whitney Test
<b>Independent Measures, 1 Condition, &gt; 2 Group</b>	One Way ANOVA	Kruskal-Wallis Test
<b>Related measures, 2 Conditions, 1 Group</b>	Paired T Test	Wilcoxon Test
<b>Related measures, &gt; 2 Conditions, 1 Group</b>	Repeated Measures ANOVA	Friedman's Test

# How to choose statistical test for your study?

Number of Dependent Variables	Number of Independent Variables (IV)	Nature of Dependent Variable (s)	Test (s)
1	0 IVs (1 population)	Interval & Normal	One-Sample T-Test
		Ordinal Or Interval	One-Sample Median
		Categorical (2 Categories)	Binomial Test
		Categorical	Chi-Square Goodness-Of-Fit
1	1 IV with 2 levels (independent groups)	Interval & Normal	2 Independent Sample T-Test
		Ordinal Or Interval	Wilcoxon-Mann Whitney Test
		Categorical	Chi-Square Test Fisher's Exact Test
1	1 IV with 2 or more levels (independent groups)	Interval & Normal	One-Way ANOVA
		Ordinal Or Interval	Kruskal Wallis
		Categorical	Chi-Square Test
1	1 IV with 2 levels (dependent/matched groups)	Interval & Normal	Paired T-Test
		Ordinal Or Interval	Wilcoxon Signed Ranks Test
		Categorical	McNemar
1	1 IV with 2 or more levels (dependent/matched groups)	Interval & Normal	One-Way Repeated Measures ANOVA
		Ordinal Or Interval	Friedman Test
		Categorical	Repeated Measures Logistic Regression
1	2 or more IVs (independent groups)	Interval & Normal	Factorial ANOVA
		Ordinal Or Interval	Ordered Logistic Regression
		Categorical	Factorial Logistic Regression
1	1 interval IV	Interval & Normal	Correlation Simple Linear Regression
		Ordinal Or Interval	Non-Parametric Correlation
		Categorical	Simple Logistic Regression
		Interval & Normal	Multiple Regression
1	1 or more interval IVs and/or 1 or more categorical IVs	Interval & Normal	Analysis Of Covariance Multiple Logistic Regression
		Categorical	Discriminate Analysis
		Interval & Normal	One-Way MANOVA
2+	2+	Interval & Normal	Multivariate Multiple Linear Regression
	0	Interval & Normal	Factor Analysis
2 sets of 2+	0	Interval & Normal	Canonical Correlation

## 1. *Training Course on Biostatistics*

Division of Epidemiology and Biostatistics, National Institute of Cancer Prevention and Research (ICMR), Noida, UP has organized short term courses on Research Methodology and Bio-statistical Analysis on March-April-May, 2018.

<http://www.icmr.nic.in/icmrnews/workshop/BETC%202018.pdf>

## 2. *Call for Proposals*



DBT

<http://www.dbtindia.nic.in/funding-mechanism/call/#>

### A. Call for proposal on Vitamin D deficiency

<http://www.dbtindia.nic.in/call-proposals-on-vitamin-d/#>

### Call for R &D Proposals on “Vitamin D deficiency in India: Public Health Significance and interventions”(Last date: 22/03/2018)

**Rationale:** Vitamin D deficiency [VDD] is prevalent globally and the data for last two decades suggests that it may be widespread in India as well. VDD is essential for bone health, and has a role in calcium homeostasis. Recent evidence suggests potential non- skeletal effects, which has led to increased interest in public health significance of VDD in the Indian context notwithstanding abundant sunshine. Worldwide naturally occurring dietary sources of VD are limited and most individuals obtain their VD from cutaneous sun exposure. In view of the recent reports of escalating burden of biochemical VDD and its known skeletal and potential extra-skeletal effects, the Department of Biotechnology proposes to support research on its public health significance and potential interventions to address this malady. **R & D Proposals** are invited in the following thrust areas:

## 2. Indo-Swiss Joint Research Programme (ISJRP)

<http://www.dbtindia.nic.in/indo-swiss-joint-research-programme-2018-19/#>

### Indo-Swiss Joint Research Programme (ISJRP), 2018-19 : Blue sky research/basic research in the life sciences

**Opening date:** 15/01/2018

**Closing date:** 16/04/2018

The Indo-Swiss Joint Research Programme (ISJRP) was initiated by the Indian and Swiss governments in 2005 in order to further advance the bilateral cooperation in scientific and technological areas of strategic relevance to both countries. The programme supports cutting-edge research that brings together faculty and young researchers from Switzerland and India. The current ISJRP call for Joint Research Projects (JRPs) is financed by the Swiss State Secretariat for Education, Research and Innovation (SERI) in Switzerland and the Department of Biotechnology (DBT) in India on the principles of reciprocity, parity and activity-matching funding.

The Swiss National Science Foundation (SNSF), mandated by the SERI, and the Department of Biotechnology (DBT) in India jointly launch the call for Joint Research Projects (JRPs), organise the evaluation of the submitted proposals and monitor the funded projects.

DST



<http://www.dst.gov.in/call-for-proposals>

#### Ministry of Science & Technology Department of Science & Technology SwarnaJayanti Fellowships 2017-18

Government of India had instituted a scheme titled "SwarnaJayanti Fellowships Scheme" to commemorate India's fiftieth year of Independence. Under this scheme a selected number of young scientists, with excellent track record, are provided special assistance and support to enable them to pursue research in frontier areas of science and technology. The fellowship is scientist specific and not institution specific.

Scientists selected for the award will be allowed to pursue unfettered research with a freedom and flexibility in terms of expenditure as approved in the research plan. The project to be submitted along with the application should, therefore, contain innovative research idea and it should have a potential of making impact on R&D in the discipline.

The duration of the fellowship along with the project will be for a period not exceeding five years.

The fellowship is open to Indian Nationals having a regular position in a recognized Indian academic/ research organization. The applicant should possess Ph.D in Science/ Engineering/ Medicine and should not be drawing Fellowship from any other Scheme of GOI.

**The fellowship is open to scientists between 30 to 40 years of age as on December 31, 2017. Applications from candidates who have completed 40 year of age as on or before 31.12.2017 will not be considered.**

Applications for the "SwarnaJayanti Fellowships Scheme 2017-18" are invited from eligible candidates. Candidates may log on [onlinedst.gov.in](http://onlinedst.gov.in) from 15.02.2018 to access the home page of the "DST e-PMS Portal" for details and submit the application in online mode only. There is no need to send a hard copy.

**The last date for submission of applications is March 31, 2018 by 1700 hrs.**

[http://www.dst.gov.in/sites/default/files/Advertisement-SwarnaJayanti-Fellowships-Scheme-2017-18\\_0.pdf](http://www.dst.gov.in/sites/default/files/Advertisement-SwarnaJayanti-Fellowships-Scheme-2017-18_0.pdf)

Government of India  
Ministry of Science and Technology  
Department of Science and Technology

### Scheme for Young Scientists and Technologists Call for Proposals

#### Encouraging young thinkers towards social development through Science & Technology

To encourage young scientists and technologists towards providing technology based/led solutions for societal challenges, Department of Science and Technology (DST) launched Scheme for Young Scientists and Technologists (SYST) in the year 1991. Innovative technological ideas in the form of proposal from young passionate researchers are thus invited under SYST, encompassing scientific interventions aimed at addressing social challenges.

<http://www.dst.gov.in/sites/default/files/callforproposal-03.pdf>

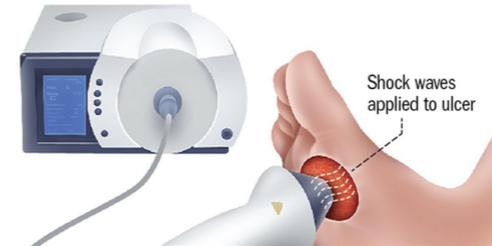
## 1. FDA approves shock wave device to treat diabetic foot ulcers

The FDA has approved the Dermapace System for treatment of chronic, full-thickness diabetic foot ulcers. The Dermapace System is intended to be used for treatment of chronic, full-thickness diabetic foot ulcers with wound areas. The device is an external (extracorporeal) shock wave system that uses pulses of energy to mechanically stimulate the wound.

<https://www.clinicaladvisor.com/diabetes-resource-center/fda-approves-dermapace-system/article/735609/>

### Healing diabetes foot ulcers

To advance the healing process, Sanuwave Inc.'s Dermapace System sends 500 acoustical shock waves into the wound to awaken blood cells, improve blood flow and generate growth hormones.



## 2. Caffeine and Parkinson disease: A possible diagnostic and pathogenic breakthrough



Most cases of Parkinson disease (PD) over age 50 are sporadic, and twin studies strongly suggest a predominance of environmental over genetic etiologies. However, few factors have been found consistently in epidemiologic studies to have major effects, protective in all cases: smoking, urate and caffeine consumption. The protective effect of caffeine (found not only in coffee, but also in tea, and some sodas) has been demonstrated in large prospectively followed populations of men, with a dramatic reduction in risk (up to fivefold for persons who drank more than 4 cups of coffee a day). Decaffeinated coffee afforded no protection, pointing to caffeine rather than other substances in coffee or tea as the underlying pharmacologic agent.

<https://sci-hub.tw/10.1212/WNL.0000000000004898>

## 3. A unique treatment for breast cancer: laser surgery

Instead of using a scalpel to cut and remove a cancer tumor, doctors use a carbon dioxide laser. When the intense beam of light touches tissue- breast or otherwise it causes the tissue to vaporize. Vaporize the tissue in order to make incision like knife would but at the same time it's sealing the lymphatic and blood vessels so there is no bleeding and little to no spreading.

<http://www.foxnews.com/health/2016/11/03/unique-treatment-for-breast-cancer-laser-surgery.html>

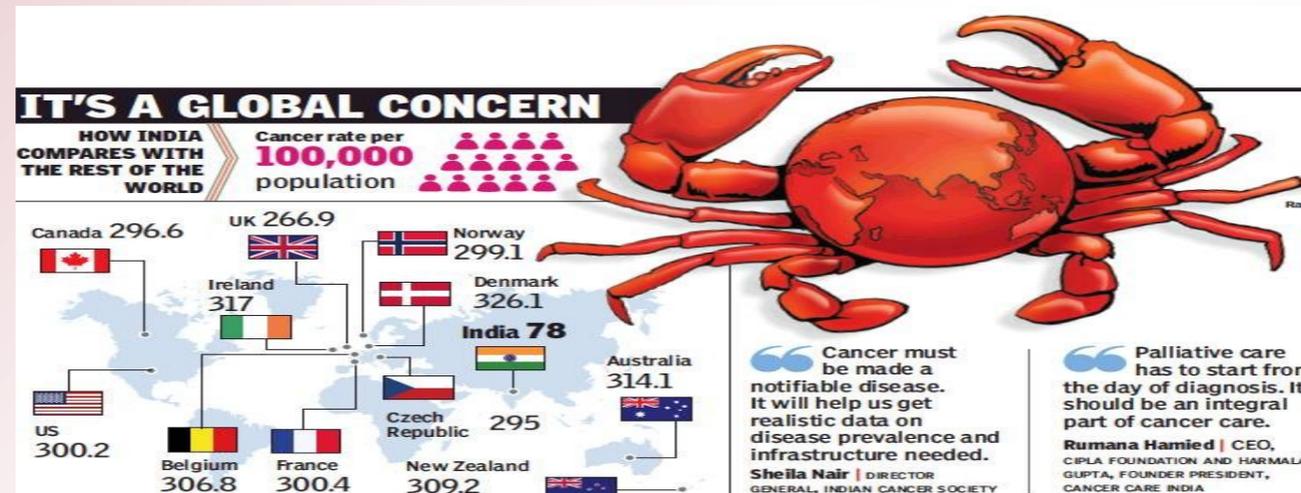


#### 4. India's cancer cases are far lower than western countries, yet death rates are higher

India's cancer graphs tell two distinct stories. The first holds out hope as India's cancer incidence is far lower than developed nations such as Denmark and the US. If cancer strikes over 300 out of every 100,000 population in Denmark, the corresponding number in India hovers around 80. But the second Indian cancer story is worrisome: cancer manages to get the upper hand in almost 70% of cases in India. A study in medical journal, The Lancet, in 2014 indicated only 30% of India's cancer patients survive for over five years.

<https://epaper.timesgroup.com/olive/apa/timesofindia/#panel=document>

<https://timesofindia.indiatimes.com/city/hyderabad/indias-cancer-cases-far-lower-than-those-in-the-west-yet-death-rate-higher/articleshow/62550136.cms>



#### Gene drive technology to combat malaria

Mosquitos are genetically modified to produce an antibody that neutralises the malaria parasite

A gene editing system (CRISPR) is used to produce a gene drive. This ensure mosquitos pass the parasite resistance genes to 99% of their offspring

In the wild, a gene drive could rapidly spread through an entire mosquito population, raising hopes of eradicating the malaria parasite

Gene drives can also be programmed to wipe out mosquitos, not just the parasites they carry. Critics say the engineered genes could spread to other organisms and alter entire ecosystems

Malaria worldwide (2016) ■ 216 million cases ■ 445,000 deaths ■ Africa: 90% of cases in 91 countries ■ 70% in children under 5 ■ 91% of deaths

Sources: Nature, PNAS, University of California, WHO,

#### 5. Gene editing could soon combat malaria

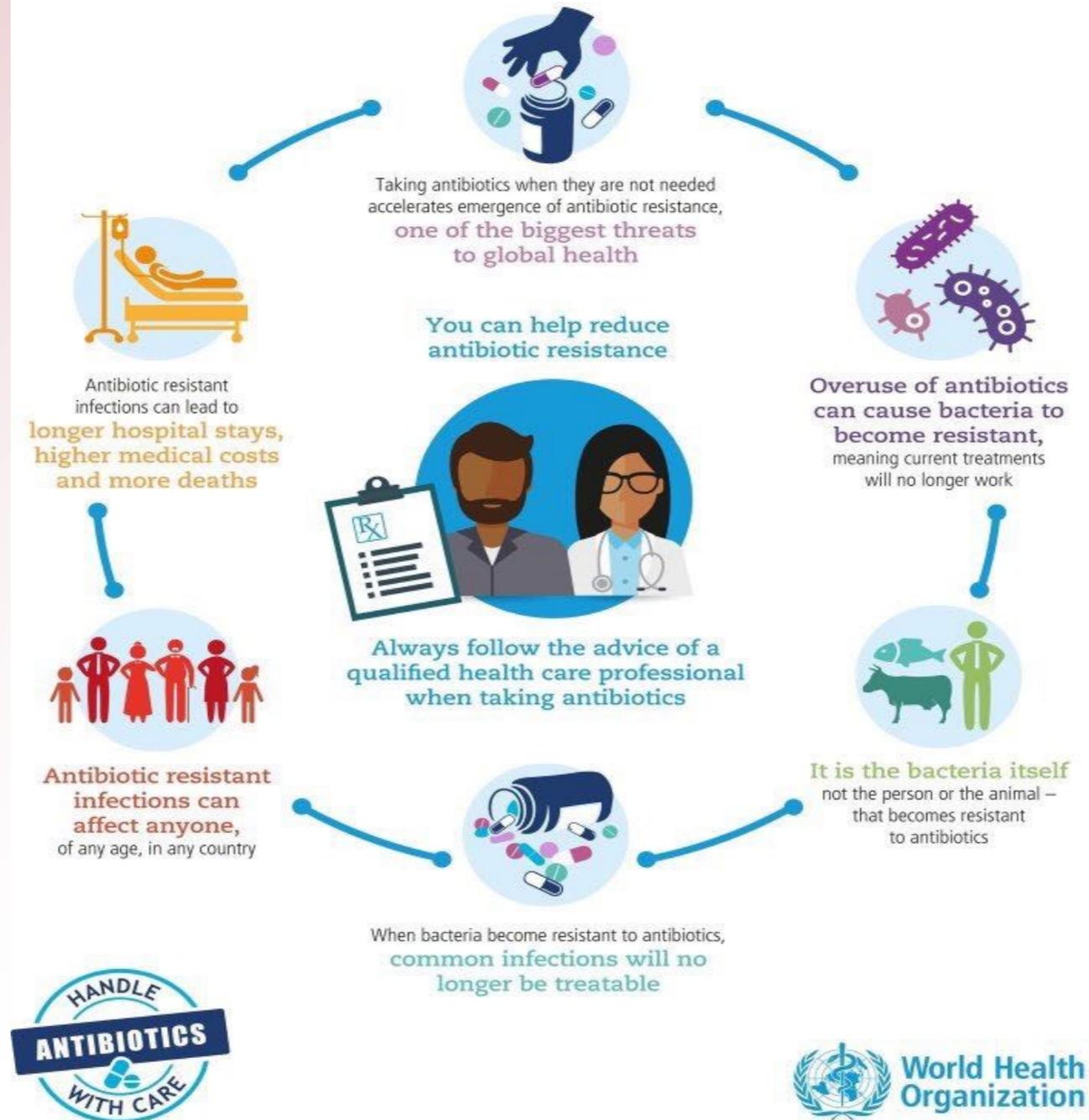
Gene Editing a discovery made only five years ago, is now used in labs all over the world. As investments rapidly grow, there is every possibility a gene drive, a form of gene editing, could wipe out diseases such as malaria. Gene drives manipulate genes of plants and animals with the idea that the tech could soon be used to treat human diseases. Though crucial, gene drives remain controversial for their potential to spread to other species and alter entire ecosystems. Scientists are cautious about ramifications, seeking thorough scrutiny for the potential environmental dangers.

<https://epaper.timesgroup.com/olive/apa/timesofindia/#panel=document>

<https://timesofindia.indiatimes.com/home/science/how-gene-editing-could-soon-combat-malaria/>

# NEWS UPDATE OF PREVIOUS RESEARCH THEME

## Misusing and overusing **ANTIBIOTICS** puts us all at risk



# BIOSTATISTICS QUIZ

1. When you read scientific literature, do you know whether the statistical tests that were used were appropriate and why they were used?

- A. Always
- B. Mostly
- C. Rarely
- D. Never



2. Which of the following statements are true?

- A. The p-value is the probability of the sample data arising by chance.
- B. The p-value is an arbitrary value, designated as the significance level.
- C. The p-value is the chance of getting an observed effect if the null hypothesis was false.
- D. The p-value is the chance of getting an observed effect if the null hypothesis was true.
- E. A very small p-value allows us to say that there is enough evidence to accept the null hypothesis.



3. Answer true or false for the following statements: The 95% confidence interval for the mean:

- A. Contains the sample mean with 95% certainty.
- B. Is less likely to contain the population mean than the 99% confidence interval.
- C. Contains 95% of the observations in the population.
- D. Is approximately equal to the sample mean plus and minus two standard deviations
- E. Can be used to give an indication of whether the sample mean is a precise estimate

4. With a case control study design

- A. We can study many different outcomes
- B. We must begin with disease free group of individuals
- C. It is easy to study diseases that have a long latency
- D. We can establish the timing of exposure and disease

5. If  $\gamma$  is the correlation coefficient between  $x$  and  $y$ , then correlation coefficient between  $2x$  and  $3y+2$  is

- A.  $\gamma$
- B.  $2\gamma$
- C.  $3\gamma+2$
- D.  $6\gamma+2$



6. The stages of a malignant disease (cancer) is recorded using the symbols 0, I, II, III, IV. We say that the scale used is:

- A. Alphanumeric
- B. Numerical
- C. Ordinal
- D. Nominal

7. If on a group of 457 patients, for a risk factor we calculated an Odds Ratio  $OR= 12.74$ , the possibility of developing the disease being investigated is:

- A. very high when exposed to the factor
- B. very small when exposed to the factor (protective factor)
- C. the same in the case of exposure in the case of non-exposure
- D. lower in the exposed than in the unexposed, OR being less than 100

8. A type of medical research that involves a prospective observational study that follows the participants forward in time to identify future outcomes is referred to as (a/an):

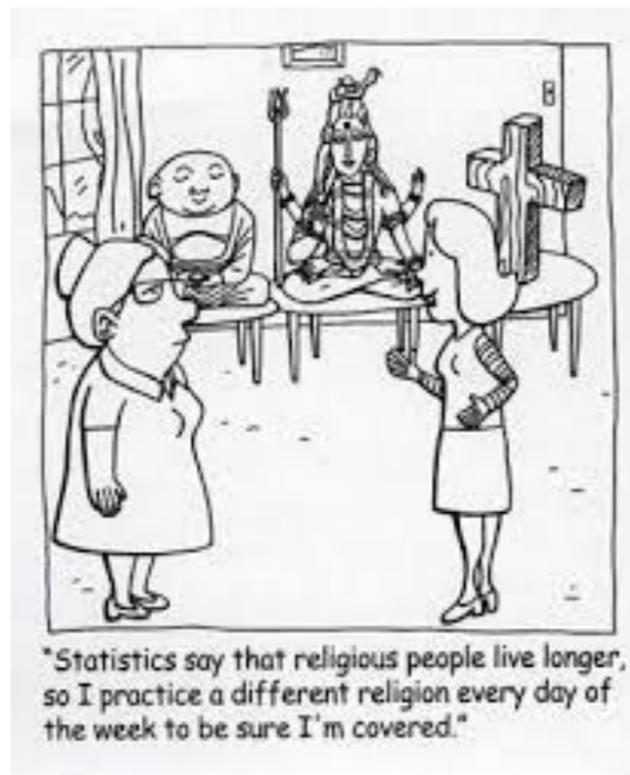
- A. Cohort study
- B. Clinical Trial
- C. Observational Study
- D. Sample

9. A statistical term that describes the amount of spread in a data set:

- A. Probability
- B. Median
- C. Standard Deviation
- D. Variance



For answers, please turn the page



For your suggestion mail us on to:

[chief.researchofficer@sumandeepvidyapeethdu.edu.in](mailto:chief.researchofficer@sumandeepvidyapeethdu.edu.in)

*Our Special Thanks to*

*Ms. Nimisha Patel & Mr. Ronak Shah*

*For support in shaping the content*

### Quiz Answers

1. A 2. B & D 3. All are false except B & E 4. C 5. A 6. C 7. B 8. A 9. D

#### Justification of question 3:

A. False: it contains the population mean with 95% certainty. It always contains the sample mean.

B. True

C. False: In repeated samples, around 95% of the 95% confidence intervals (CI) will contain the population mean. Another way to think about 95% CI is if the same study were repeated 100 times then the mean of 95 of these 100 studies would lie somewhere within the 95% CI.

D. False: is approximately equal to  $\pm$  two standard errors about the sample mean.