UANL
UNIVERSIDAD AUTÓNOMA DE NUEVO LEÓN

FACULTAD DE MEDICINA

MODULE DESCRIPTION (ANALYTICAL PROGRAM).

Module Information Code:	
● Name of the Institution and School	Universidad Autónoma de Nuevo León, School of Medicine
● Name of the learning Unit	Biostatistics
Total classroom hours for theory and/or practice.	40 hrs.
● Total extra classroom hours	50 hrs.
● Course Modality	Schooled
● Type of academic period in which the module is offered	4° Semester
● Type of Learning Unit in the Curriculum	Compulsory
● Curriculum area:	Basic formation curricular area
● UANL credit points	3
● Date of module creation:	17/09/2015
● Date of last amendment:	14/01/2021
● Person(s) responsible for the module design and amendments:	Dr. Raúl Gabino Salazar Montalvo. M.C. María Guadalupe Rodríguez López

1. Introduction

Statistics is a science that is oriented towards data collection and analysis, efficiently for the purpose of achieving significant results. as well as interpretations that can provide credible and substantiated explanations It is of great importance when defining action plans, when making decisions and have a clear picture of the context in which you operate. When this subject are is applied to life sciences as medicine, biology, genetics, etc. this is called biostatistics, becoming one of the main tools that enables reliable results in any kind of study. The learning unit integrates the necessary competences to analyse the trend and control of health-related events in a population. through its description, identification of their variation and the establishment of relations between the processes affecting them. For that, the learning unit develops a training sequence based on the following stages: basic concepts; Organization of data and frequency tables; Central trend and dispersion measures in ungrouped and grouped data. Distribution of normal or Gaussian probability, regression analysis and simple linear correlation.

2. Purpose(s)

It analyses the trend and control of health-related events in a population, through its description, through its variation and the establishment of relations between the processes that affect it, in support of the establishment of diagnosis, preventive measures, forecast and rehabilitation.

It contributes to the training of a competent doctor to solve the main health problems of the first level of care for the individual and community through the statistical analysis of the population and it's a fundamental part of getting into a postgraduate course.

It relates to research methodology to make the core part of the results analysis and interpretation research; with preventive medicine for the correct description of the population, in coverage of preventive schemes and health prpgrammes.In the sixth semester, it relates to pharmacology for biokinetic analysis of medicinal products; and with work medicine to perform the statistical analysis of accidents and diseases that originate in the performance of the job. In the seventh semester it relates to epidemiology and public health in the description of the population in decision-making for the implementation of specific health programmes.

It responds to the university's general competences, since the development of self-learning is privileged, it uses mathematical reasoning and handles information technologies by resolving health problems,using research methods and techniques, and generating modifications to existing health programmes. Commitment is encouraged towards intervention to resolve prevalent health problems in the community with professional responsibility and ethics.

With regard to the specific competences of the profession, the scientific foundations of medicine are used by analysing economic and social factors to contribute in the form of decisions and medical actions. Health problems are analysed by putting professional ethics before, to educate the population on risk factors related to the development and prevention of the disease whether these are physical social or cultural.

3. Competences of the graduate profile

a. General competences of the graduate profile to which the learning unit contributes:

Instrumental competences:

2. Use the logical, formal, mathematical, iconic, verbal and non-verbal languages according to their stage of life, in order to understand, interpret and express ideas, feelings, theories and streams of thinking with an ecumenical focus.

3. Use the information and communication technologies as access tools to information and its transformation in knowledge, as well as for learning and collaborative work with cutting-edge techniques that allow its constructive participation in society.

5. Employ logical, critical, creative and proactive thinking to analyze natural and social phenomena that let them make relevant decisions in its area of influence with social responsibility.

8. Use methods and techniques of traditional and cutting-edge research for the development of their academic work, the practice of their profession and the generation of knowledge.

Personal and social interaction skills

9.- Maintain an attitude of commitment and respect towards the diversity of social and cultural practices that reaffirm the principle of integration in the local, national and international context with the purpose of promoting environments of peaceful coexistence.

11. Practice the values promoted by the UANL: truth, equality, honesty, liberty, solidarity, respect for life and anyone's, peace, respect for nature, integrity, ethics, behavior and justice, within their personal and professional environment in order to make a sustainable society.

Integrative skills

13. .Take the lead according to social and professional needs to promote relevant social change.

14. Resolve personal and social conflicts in accordance with specific techniques in the academic field and their profession for the proper decision making.

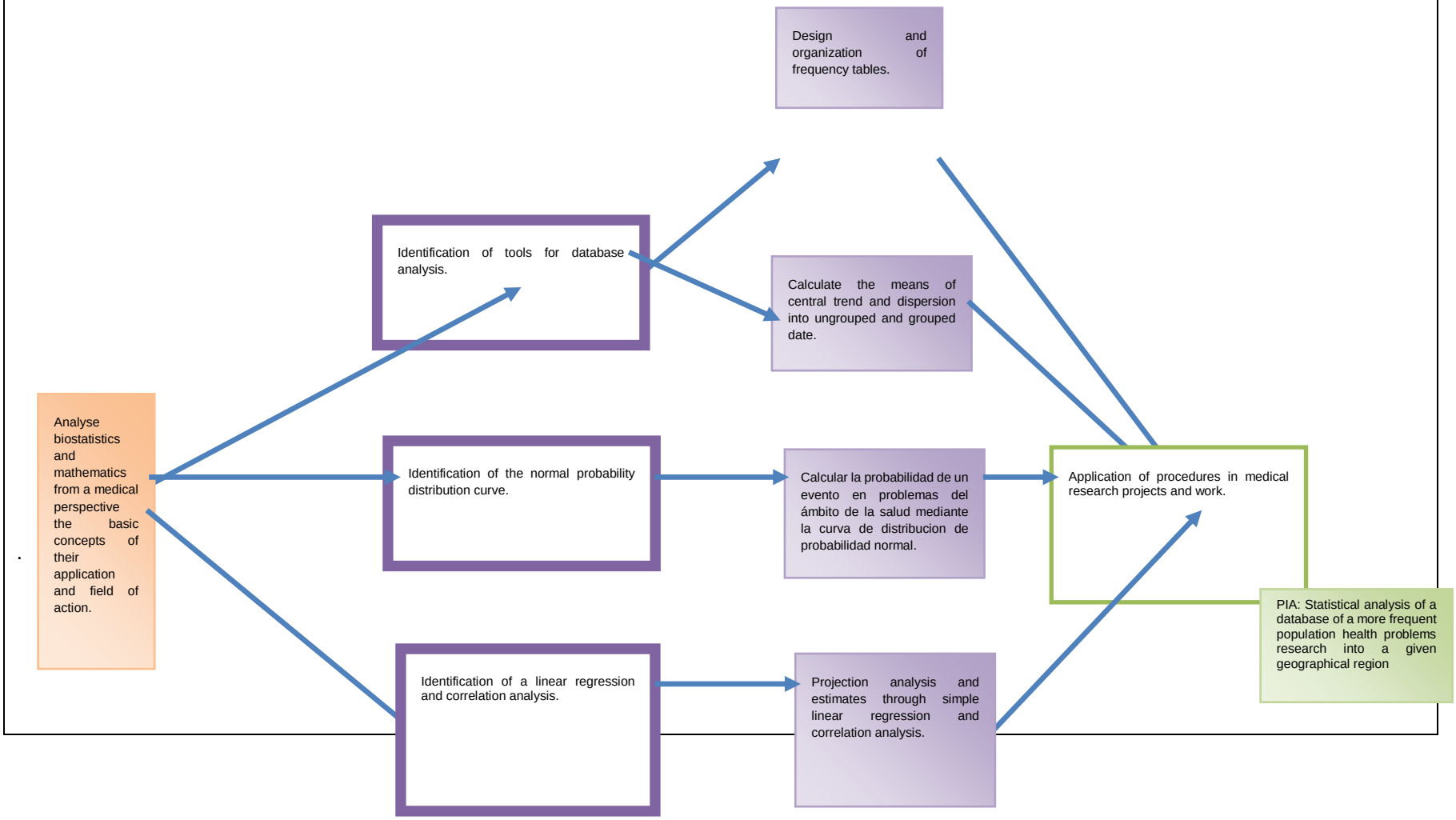
b. General competences of the graduate profile to which the learning unit contributes:

1.- Use the medicine scientific fundaments considering economical, psychological, social, cultural and environmental factors which contribute to the development and evolution of a disease for decision-making and medical actions.

3.-Manages information and communication technologies as a tool for accessing to information and transform it into knowledge, as well as for learning purposes and collaborative work with cutting-edge techniques which allow an edifying participation in society.

7.-Applies the scientific method for the resolution of medical problems with an innovative, analytic and self-critical attitude for preventing, diagnosing and treating diseases.

4. Course roadmap:



5. Structuring into stages or phases

Phase 1: Basic concepts

Component(s) of the competence:

Apply the basic concepts of biostatistics and mathematics in various areas como farmacología, as epidemiology and public health for the resolution of medical problems.

Evidence of student learning	Performance Criteria	Learning activities	Contents	Resources
1.- Resolution of health problems related to the basic concepts of biostatistics.	Analyses the impact of biostatistics on the interpretation of medical research. Defines, classifies biostatistics by determining its field of study. Identifies the basic concepts of biostatistics. Defines and classifies the variables types. Identifies basic concepts of arithmetic. Defines algebra and solves basic algebraic operations. Solves linear equations of different degrees.	Briefing by the facilitator of the topic; Basic concepts of biostatistics and mathematics. The key concepts of the topic are clarified. Participation in group discussion with questions asked by the facilitator. Basic biostatistical concepts are exemplified. Students provide answers to questions of the basic concepts questionnaire. Algebraic problems are being presented for their resolution. Students solve algebraic problems and linear equations with formula, procedure and product.	**Conceptual content:** Biostatistic generalities. Definition of biostatistics. Biostatistic classification. -Descriptive -Inferential Basic concepts: *-Data* *-Population* *-Sample* *-Parameter* *-Statistical* Variable classification *-Qualitative and quantitative variables.* *-Dependant and independent variables.* basic math concepts	School of Medicine classrooms. Projector. Computer. Blackboard. Technology support. Textbook. Internet link. Biostatistics manual. Department of Preventive Medicine and Public Health.

	Legibly and on time submission.		Basic concepts of arithmetic. Basic algebraic operations. Solution of equations of one variable. **Procedural content** Use the bases for biostatistics in the population analysis in the medical area. Apply mathematical models in problem solving. Calculate algebraic expressions and linear equations. **Attitudinal Content** Interest in new knowledge. Attention to the content taken. Responsibility and organization of their practical activities. Honesty in individual w Commitment to work. Respect for the confidentiality of the data.	

			Ethical handling of information. Respect for the statistical procedures..	

Phase 2: Organization of data and frequency tables.

Component(s) of the competence:

Build frequency tables and data organisation through the analysis and interpretation of the information they contain, for use in research projects and presentations.

Evidence of student learning	Performance Criteria	Learning activities	Contents	Resources
2.- Frequency table by organizing data obtained from a population by interpreting results.	Designs and interprets frequency distribution tables. Determines the usefulness of the use of frequency distribution tables. Defines and calculates the indicators that compromise a frequency distribution table. Draws frequency distribution tables. Applies frequency distribution tables to determine the characteristics of a population. Legibly and on time submission.	Briefing by the facilitator of the topic. Organization of data and frequency tables. The key concepts of the topic are clarified. Participation in group discussion with questions asked by the facilitator. The student builds a frequency board from a series of data. The student interprets the results obtained in the frequency table.	**Conceptual content** Data organization. Qualitative Data. Quantitative data Construction of the frequency table. -Class intervals. - Real Inferior and Superior limit. -Real class intervals. -Class mark -Amplitude -Absolute frequency. -Absolute relative frequency. -Absolute relative percentage frequency -Accumulated frequency. -Accumulated relative frequency.	School of Medicine classrooms Projector. Computer. Blackboard. Technology support. Textbook. Internet link. Biostatistics manual. Department of Preventive medicine and Public Health.

			-Accumulated relative percentage frequency. Graphic types: -Bar chart. -Circular chart. -Histogram -Frequency polygon. -Accumulated frequency polygon (ojiva) Warhead porcentual -Pictogram **procedural content** Organizes the information according to the data to be analysed. Appropriate and correct formulation of a frequency table. Interprets the meaning of frequency tables. **Attitudinal content** Interest in new knowledge. Attention to the content taken.	

			Responsibility and organization of their practical activities. Honesty in individual Commitment to work. Respect for the confidentiality of the data. Ethical handling of information. Respect for the statistical procedures..	

Phase 3: Central tendency and dispersion measures in ungrouped and grouped data.

Component(s) of the competence:

Use central trend and dispersion measures in ungrouped and grouped data in population and/or samples of medical research projects in order to highlight relevant information suggesting conclusions and contributing to decision-making in health problems.

Evidence of student learning	Performance Criteria	Learning activities	Contents	Resources
3.Resolution of exercises of a health problem in a population and in a sample.	Calculate and interpret central trend and dispersion measures for ungrouped data in a population and/or sample. . Defines and calculates central trend measures for ungrouped data: half rage, mean, range, minimum and maximum value. Defines and calculates dispersal measures for ungrouped data:average deviation,variance, typical deviation and variation coefficient. Analyses and interprets central trend and dispersion measures for	Statement by the facilitator of the topic of central trend and dispersion measures in ungrouped and grouped data. The key concepts of the topic are clarified. Participation in group discussion with questions asked by the facilitator. The student resolves exercises of central trend and dispersion measures in ungrouped data. Central trend and dispersion measures are interpreted into ungrouped data.	**Conceptual Content** Ungrouped data. Central trend measures. -Average -Mean -Moda -minimum value -maximum value -Range Dispersion measures -Variance -Standard deviation -Average deviation -Coefficient variation. Group data. Central trend measures -Mode -Median	School of Medicine classrooms. Projector. Computer. Blackboard. Technology support. Textbook. Internet link. Biostatistics manual. Department of Preventive medicine and Public Health.

	ungrouped data to describe a population or sample. Calculates and interprets central trend and dispersion measures in data grouped into a population frequency table and/or sample. Defines and calculates central trend measures in data grouped into an average frequency table: average half arithmetic, medium,range and percentiles. Defines the calculation of dispersion measures data grouped in a frequency table: average deviation, variance, typical deviation and variation coefficient. It analyses and interprets central trend and dispersion measures for data grouped in a frequency table to	The student completes the grouped data table and calculates central treend and dispersion measures. Se interpreta el gráfico dando significados. The student elaborates the graphics locating the average, medium and range.	-Mean Dispersion measures. -Variance -Standard mediation -Coefficient variation -Percentiles **Procedural content** Apply statistical models in solving health problems. To denote mathematical models for ungrouped and grouped data. It adequately and correctly formulates procedures for the analysis of ungrouped and grouped data. Interpreta el significado de las medidas de tendencia central y dispersión en datos sin agrupar y agrupados. It interprets the meaning of central trend and dispersion measures in ungrouped and grouped data.	

	describe a population or a sample. Legibly and on time submission		**Attitudinal content** .Interest in new knowledge. Attention to the content taken. Responsibility and organization of their practical activities. Honesty in individual w Commitment to work. Respect for the confidentiality of the data. Ethical handling of information . Respect for the statistical procedures	
4.-Written partial evaluation of phaseI, II y III.				

Phase 4: Normal probability (Gaussian) distribution.

Component(s) of the competence:

Analyse the continuous distribution of normal probability, its properties and graphic representation in respect of the area under the normal curve to establish normal values or limits in health problems.

Evidence of student learning	Performance Criteria	Learning activities	Contents	Resources
5.- Resolution of probability exercises from the occurrence of an event in a population.	Defines normal probability distribution. Identifies the properties of the normal probability curve. Average=0; the total area under the curve is equal to 1; half curve equals to 0.5; symmetry property and transformation of standard values. Interprets the normal probability distribution curve. Applies the normal probability distribution curve to calculate the possibility of an event occurring. Legibly and on time submission	Statement by the facilitator of the topic distribution of normal probability. The key concepts of the topic are clarified. Participation in group discussion with questions asked by the facilitator. Probability problems are solved by calculating Z values and using the standard values table. The student builds the gauss bell and delimits the are under the curve. The results obtained in the gauss bell are interpreted.	**Conceptual Content** Properties of the normal Distribution Curve. Standard Normal Probablity Distribution Standard normal probability distribution. Calculation of areas under the curve. -Of one Z value. Minor ranges of a value (X). -Major range of a value (X) -Range of an interval -With a Z value that gets canceled. **Procedural Content**	School of Medicine classrooms. Projector. Computer. Blackboard. Technology support. Textbook. Internet link. Biostatistic work manual. Department of Preventive medicine and Public Health.

			identifies the elements and properties of the normal distribution curve. Uses standard normal probability distribution. Calculates properly the areas under the curve. Interprets the meaning of normal probability distribution in the health area. **Attitudinal content** Interest in new knowledge. Attention to the content taken. Responsibility and organization of their practical activities. Honesty in individual Commitment to work. Respect for the confidentiality of the data. Ethical handling of information Respect for the statistical procedures	

Phase 5: Regression analysis and simple linear correlation.

Component(s) of the competence:

Establish the degree of relationship between two variables related to health problems in projections or estimates in medical research products.

Evidence of student learning	Performance Criteria	Learning activities	Contents	Resources
6.-. Regression and linear correlation analysis and interpretation of results.	Defines regression and linear correlation and identifies its usefulness in the health area. Design dispersion diagrams. Calculates the coefficients of regression and linear correlation. Determines the linear regression equation. Calculates the error of estimation and the error of forecast. Applies the linear regression and correlationLegibly and on time submission analysis to determine the reliability of the degree of relationship between two variables.	Exposición por parte del facilitador del tema análisis de regresión y correlación lineal simple. Briefing by the facilitator of the topic analysis of simple linear regression and correlation analysis. The key concepts of the topic are clarified. Participation in group discussion with questions asked by the facilitator. A Series of data from the variables X is provided and the student then draws up a dispersion diagram. The correlation coefficient is calculated ® the regression slope (b) and the intersection for X,Y variables.	**Conceptual content** Dispersion diagram *Simple linear regression analysis. Estimation and construction of the regression straight Correlation coefficient (R) -Y Estimated (Ŷ) -Regression slope (B) -Regression intersection. (A) *Standard error of estimate. *Standard forecast error. **Procedural Content** Graphically expresses a dispersion diagram and a regression line	Medical school classrooms. Projector. Computer. Blackboard. Technology support. Textbook. Internet link. Biostatistic work manual. Department of Preventive medicine and Public Health.

		The regression equation is calculated. the students draw the regression straight in the scatter diagram. The standard error of estimation is calculated and also the standard error of forecast is calculated. The student performs the estimated Y calculations for different unknown values of X	Calculate the correlation coefficient appropriately. Correctly interprets the simple linear regression analysis. Estimates the standard error of estimate and standard error forecast. Performs interference using the regression line into health problems. **Attitudinal Content**	
7.- Parcial written evaluation of phase IV y V.			Interest in new knowledge. Attention to the content taken. Responsibility and organization of their practical activities. Honesty in individual Commitment to work. Respect for the confidentiality of the data. Ethical handling of information Respect for the statistical procedures	

7. Summative evaluation.

Solving health problems related to the basic concepts of biostatistics. ……...…….…….6%

Frequency table by organizing data obtained from a population and interpreting the results.…….....7%

Solving exercises of a health problem in a population and in a sample.……..7%

Solving probability exercises of occurrence of an event in a population…….……7%

Regression analysis and linear correlation and interpretation of results..……..…….....7%

Written partial evaluation of phase I, II y III……..……23%

Written partial evaluation of phase IV y V…….…….....23%

CIP……...……..20%

Total.……100%

8. Course Integrative Product.

Analysis of a database in a research study about the most frequent population health problems of a specific geographical region.

9. Bibliography, bibliohemerography and electronic sources.

References:

Celis de la Rosa, A. (2004). *Bioestadística*.México, D.F.: El Manual Moderno.

Pagano, R. (2011). *Estadística para las ciencias del comportamiento*. México, D.F.: Cengage Learning.

Manual de trabajo de Bioestadística. Departamento de Medicina Preventiva y Salud Pública.

Source books:

Daniel W. (1995). *Bioestadística.Base para el análisis de las ciencias de la salud*. México: Limusa.

Rosner, B. (2006) Fundamentals of Biostatistics. Belmont, CA. Thomson Learning.

Villa Romero, A., Altamirano Moreno, L., Garcia de la Torre, G. (2011) Epidemiologia y Estadistica en Salud Pública. México D.F. Mc. Graw Hill.

Electronic sources:

https://sites.google.com/site/sitesagradopythia/concepto-y-aplicaciones-de-la-aritmetica

www.medicalbiostatistics.com

http://www.bioestadistica.uma.es/baron/bioestadistica.pdf

http://www.hrc.es/bioest/M_docente.html

APPENDIX.

ASSESSMENT AND WORKLOAD

Module workload		Number of hours	Percentage
Contact hours	Class-based instruction	18h (45%)	44.44%= 40 horas
	Problem solving	2h (5%)	
	Frequency table	3h(7.5%)	
	Excercise solving	5h(12.5%)	
	Regression analysis and linear correlation	3h (7.5%)	
	Exam taking	6h (15%)	
	Course integrative producto (CIP)	3h (7.5%)	
Independent study	Study	35h (70%)	55.55%= 50 horas
	Exam preparation	15h (30%)	
Total hours of the workload: 30 hours X 3 credits UANL/ECTS*		90 h	

*European Credit Transfer and Accumulation System
1 UANL credit = 30 hours

NOTE: Rubrics, checklists and evaluation formats are elaborated by using the performance criteria described in each stage of the module.

SUPLEMENTO COVID-19

Siguiendo las recomendaciones de la Secretaría de Salud del país y la Rectoría de la Universidad, ante la coyuntura de salud COVID-19, la organización de la docencia desde marzo del 2020, seguirá un modelo híbrido, donde la docencia se ajustará a los horarios aprobados por la Secretaría de Salud siguiendo un modelo de Presencialidad / No presencialidad en la medida en que las circunstancias sanitarias y la normativa lo permitan. Los estudiantes asistirán a las clases de manera no presencial mediante la transmisión de las mismas de manera síncrona/asíncrona vía “on line”.