

# CIENCIA DE DATA VS CIENCIA DE DECISION: RESULTADOS DE ACDC

**DR. AMADO ALEJANDRO BAEZ**

**CENTER OF OPERATIONAL MEDICINE  
MEDICAL COLLEGE OF GEORGIA**

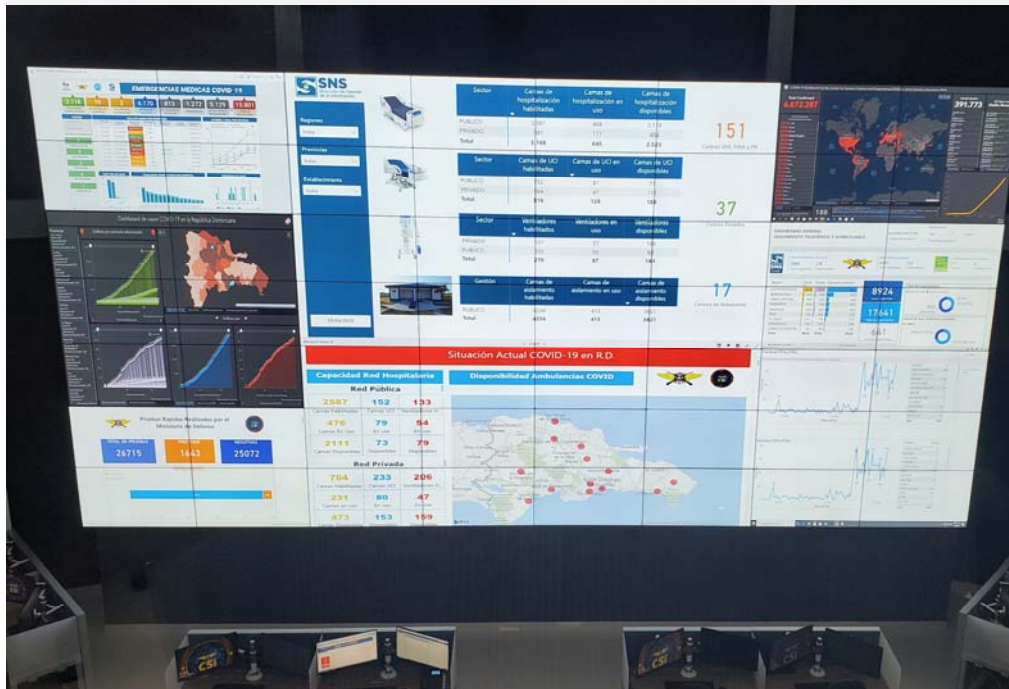
**UNPHU**



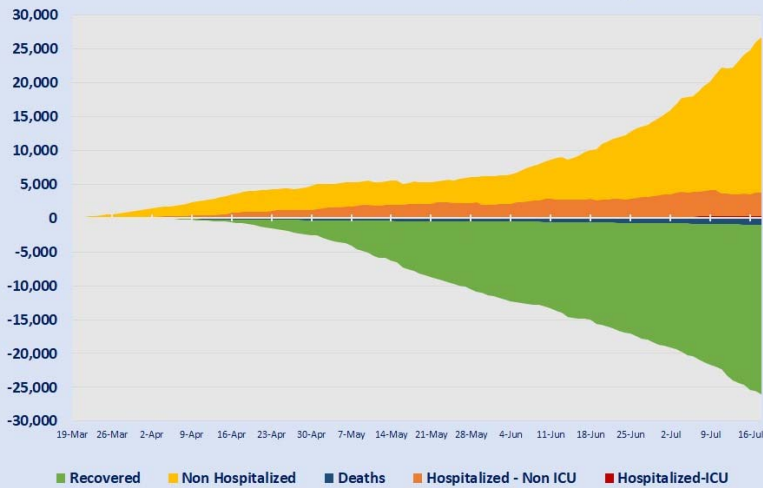


Lanzamiento Centro Fusión de Inteligencia Epidemiologica At C5i Abril 2020

# LANZAMIENTO DEL C5I MIDE RD

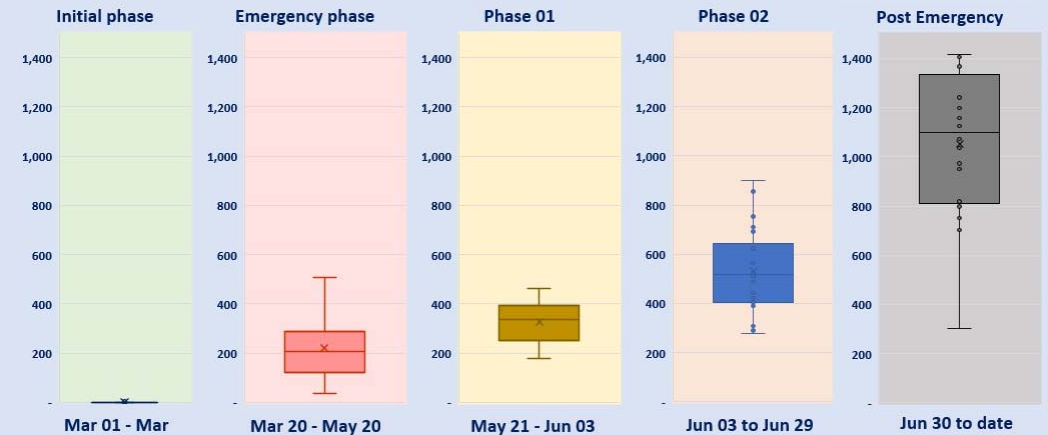


Trend of COVID-19 in Dominican Republic



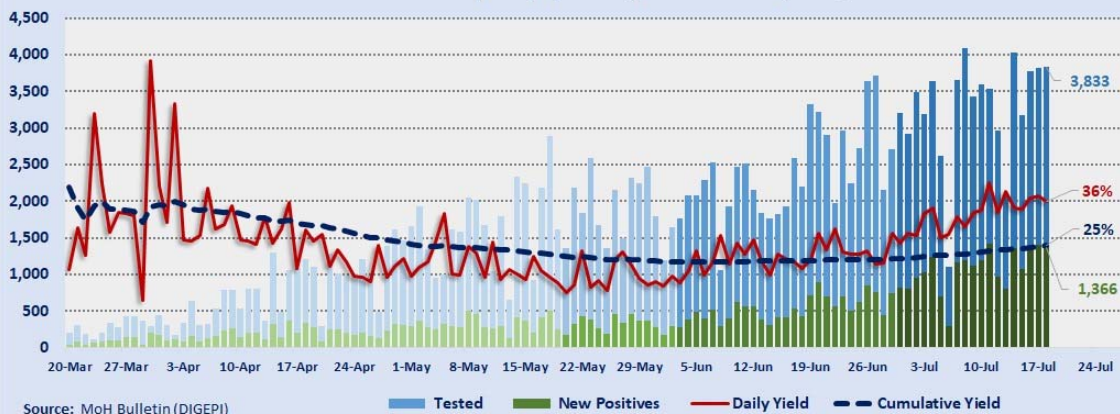
Source: MoH Bulletin (DIGEPI) Excess Recovered reported in Bulletins 59-60 & 73-74 redistributed over entire period

Trend of new COVID-19 cases by phase in Dominican Republic



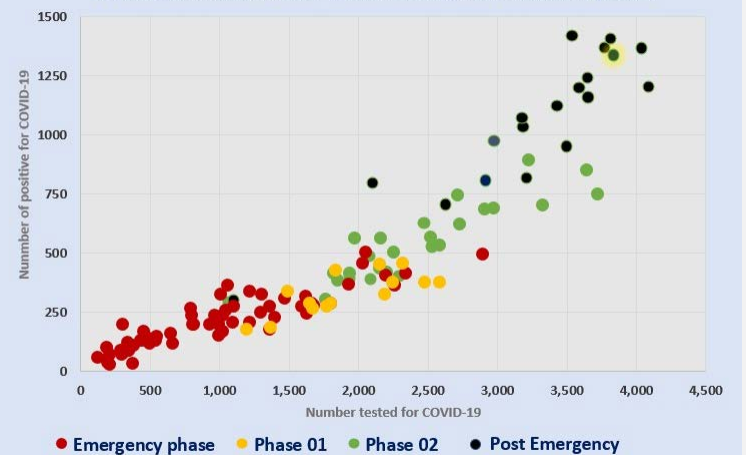
Source: MoH Bulletin (DIGEPI)

Trend tested for COVID-19 and yield (% positive), Dominican Republic, March 20 to date



Source: MoH Bulletin (DIGEPI)

COVID-19 in Dominican Republic - Trend in number tested vs. number of positives



Source: MoH Bulletin (DIGEPI)

# Analisis consolidado de data epidemiologica para combate del COVID 19 CEGES- 2020

Regiones

 All ▼

Provincias

 All ▼

Establecimiento

 All ▼

7/19/2020



Sector	Camas de hospitalización habilitadas	Camas de hospitalización en uso	Camas de hospitalización disponibles	% de ocupación
PUBLICO	2,471	1001	1,470	41%
PRIVADO	964	795	169	82%
<b>Total</b>	<b>3,435</b>	<b>1796</b>	<b>1,639</b>	<b>52%</b>



Sector	Camas de UCI habilitadas	Camas de UCI en uso	Camas de UCI disponibles	% de ocupación
PUBLICO	187	155	32	83%
PRIVADO	274	196	78	72%
<b>Total</b>	<b>461</b>	<b>351</b>	<b>110</b>	<b>76%</b>



Sector	Ventiladores habilitados	Ventiladores en uso	Ventiladores disponibles	% de ocupación
PUBLICO	172	104	68	60%
PRIVADO	181	94	87	52%
<b>Total</b>	<b>353</b>	<b>198</b>	<b>155</b>	<b>56%</b>



Gestión	Camas de aislamiento habilitadas	Camas de aislamiento en uso	Camas de aislamiento disponibles	% de ocupación
PUBLICO	4166	346	3820	8%
<b>Total</b>	<b>4166</b>	<b>346</b>	<b>3820</b>	<b>8%</b>

# 152

Centros SNS, FFAA y PN

# 54

Centros Privados

# 17

Centros de Aislamiento

# INTEGRACION DE RT A ANALISIS

Total Cases To Date  
**51,519**

Total Deaths To Date  
**971**

Window period  
 14-day  
 7-day

Date range  
3/4/2020 7/19/2020

**i** Please review caveats before using presented analysis

Dominican Republic



Serial Interval Estimate  
 Select all  
 Li et al.  
 Modeling Task Force  
 Nishiura et al.

Confidence limits  
 No  
 Yes

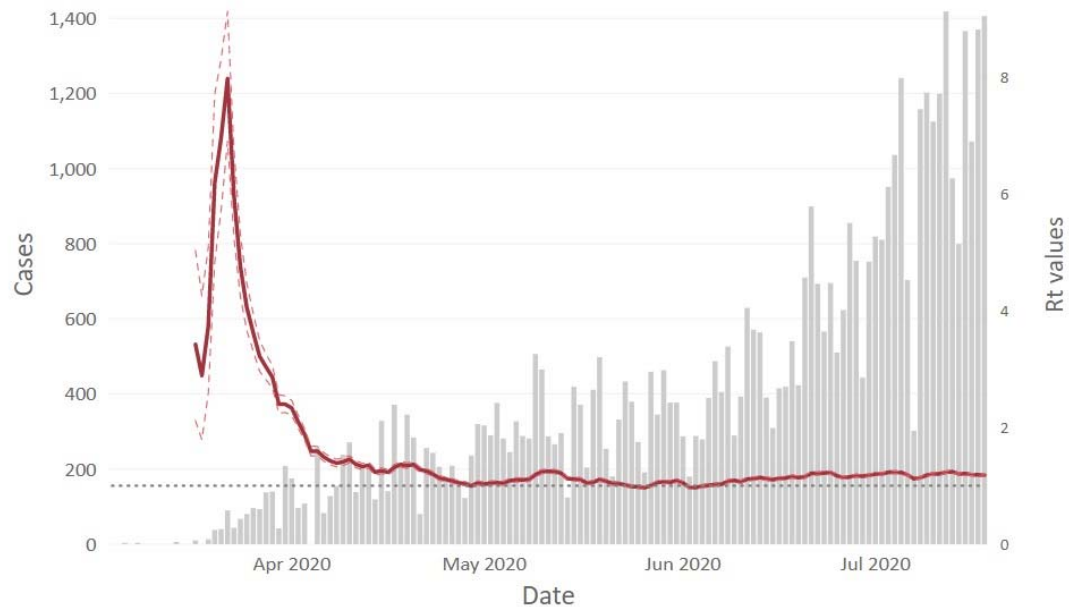
### Estimates of Time-Varying R (Rt)

Serial interval estimate by Li et al.  
Mean: 7.5 days (SD: 3.4 days)

Serial interval estimate by **Modeling Task Force (MTF)**  
Mean: 6.14 days (SD: 3.96 days)

Serial interval estimate Nishiura et al.  
Mean: 4.7 days (SD: 2.9 days)

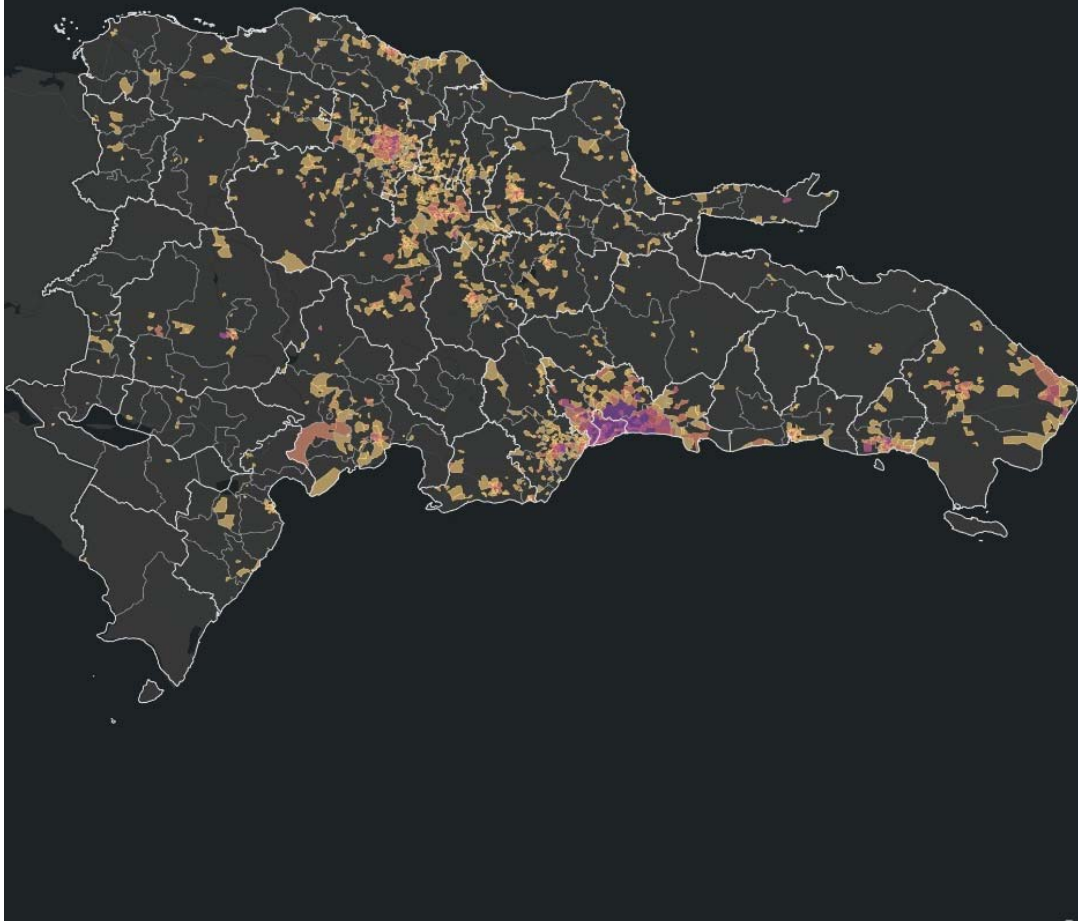
Please direct queries to:  
Garrett Fox (ogw1@cdc.gov)  
Roma Bhatkoti (nli0@cdc.gov)  
Imran Mujawar (lrz5@cdc.gov)



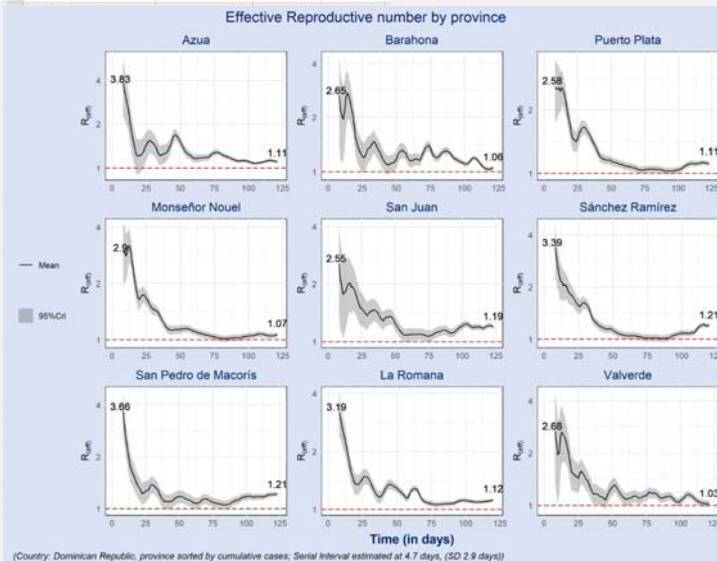
**Source:** COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at [Johns Hopkins University](#)  
**Methodology:** Script and methodology provided by CDC IMS 2019 NCOV Response Modeling Task Force

**Data as of date:**  
Saturday, July 18, 2020

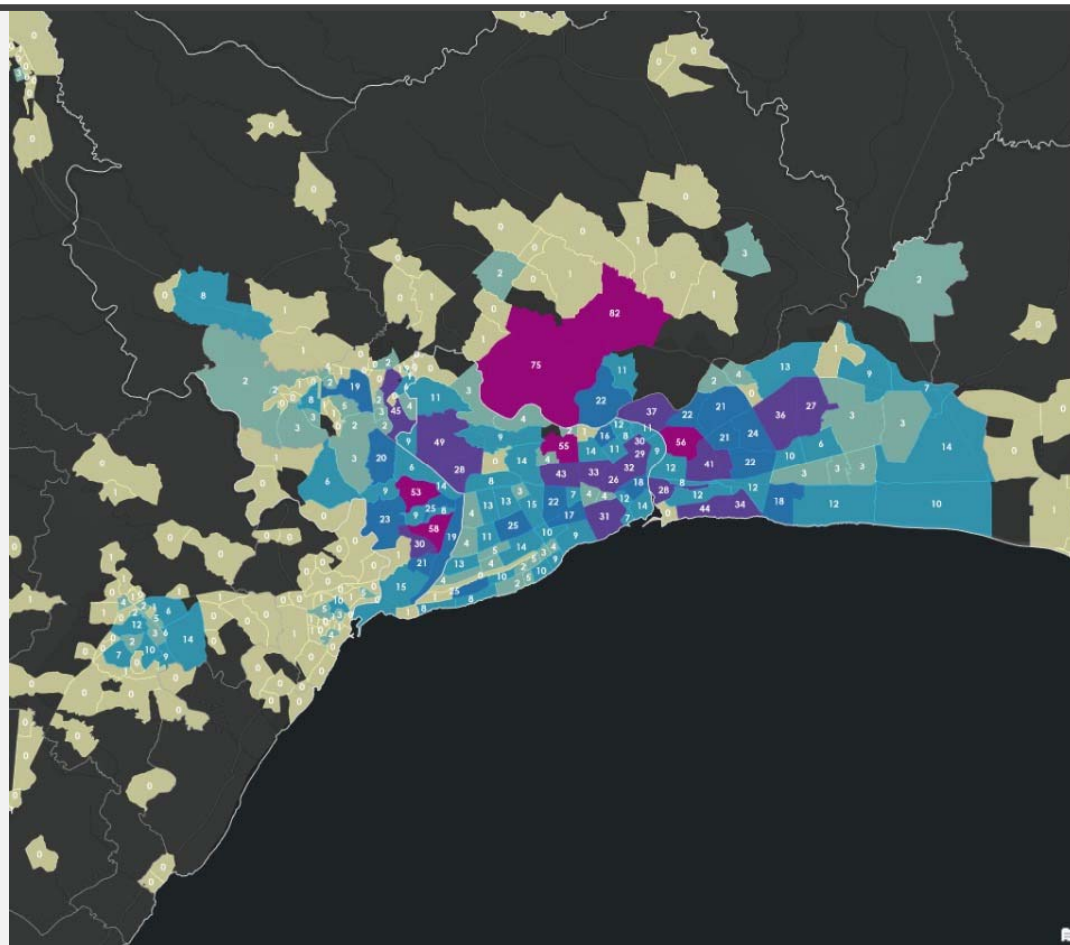
# ANALISIS DE DATA (HEAT MAPPING) A NIVEL LOCAL/PROVINCIAL



MUNICIPIO	CUMULATIVO	ACTIVO	RECUPERADOS
HERZOGIA	150	190	8
HERZOGIA	490	190	8
CRISTO REY	451	81	15
GUAYAMA	402	90	9
VILLA LUISA	343	92	4
ALMA ROSA	339	111	3
JOS RIOS	300	70	6
ENSANCHE QUESQUEYA	283	41	2
VILA FARO	250	72	4
JOS TRIS BRAZOS-JARDINES	240	57	7
AITOS DE ARROYO HONDO	236	50	4
JOS MINA SUR	229	55	8
ENSANCHE NACIO	221	58	4
SANTA CRUZ	216	34	2
BUENOS AIRES INDEPENDEN	210	51	2
ENSANCHE LA FE	206	40	5
JOS MANEYES	202	56	2
PANTOJA	197	80	2
NUJEVO ARROYO HONDO	190	15	4
LAS CAJAS	190	59	1
HAINAMOSA	189	35	10
VILA DUARTE	186	45	3
EL ALMIRANTE	179	53	9
DE LA VISTA	178	54	3
SABELLA	177	34	4
CANCINO	176	39	3



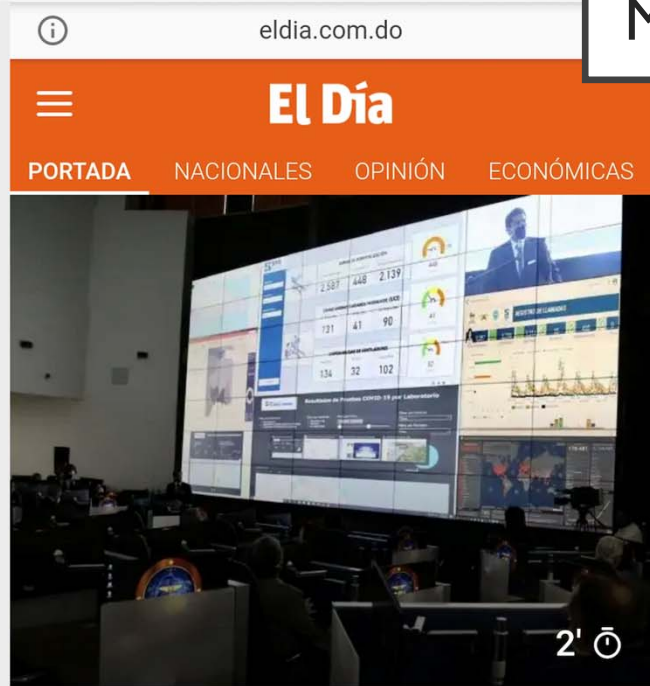
# ANALISIS DE DATA (HEAT MAPPING) A NIVEL LOCAL/PROVINCIAL



BP_COD	CONFIRM.	ACTIVO	FALLEC.	RECUPER.
SAEANA PERDIDA	422	102	7	313
VILLA MELLA	319	82	3	234
GLARICANO	342	75	9	258
HERRERA	276	58	2	216
LOS MINA SUR	191	56	8	127
CRISTO REY	364	55	13	296
LAS CAÑAS	132	53	1	78
ALTOS DE ARROYO HONDO	202	49	4	149
PANTOJA	125	45	1	79
LOS MAMEYES	142	44	2	96
ENSANCHE LA FE	180	43	3	134
AIMA ROSA	223	41	1	181
LOS TRES ERAZOS-JARDINES	186	37	4	145
HANAMOSA	164	36	9	119
ISABELITA	121	34	4	83
VILLA JUANA	261	33	3	225
MEMORAMENTO SOCIAL	145	32	3	110
GAZOLE	119	31	1	87
ENSANCHE ESPALLAT	121	30	5	86
ENSOMBE	151	30	1	120
MARIA AUXILIADORA	141	29	1	111
LOS RIOS	223	28	5	190
VILLA DUARTE	141	28	3	110
EL ALMIRANTE	119	27	7	85
VILLA CONSUELO	103	26	3	74
BUENOS AIRES (INDEPENDEN	123	25	0	98
ENSANCHO QUIQUEVA	238	25	1	212
JUAN PABLO DUARTE	117	25	1	91
LOS TRINITARIOS	95	24	2	69
BAYONA	87	23	4	60
ENSANCHO NACO	160	22	4	134
LOS MINA NORTE	93	22	2	69
VILLA SARO	102	22	2	78
SANTA CRUZ	185	22	2	161
LA ALAGRACIA	92	21	3	68
MENDOZA	76	21	1	54
CAVANO	147	21	3	123
SAN MIGUEL	65	20	1	44
PUEBLO NUEVO	98	19	1	78
ZONA INDUSTRIAL HERRERA	64	19	1	44
VILLA FRANCISCA	74	18	2	54
LAS CAÑAS	62	18	0	44
LA ESTERILLA	90	17	3	70
ENSANCHO CAPOTILLO	93	16	1	76
PIANTI	126	15	1	110
SANTO DOMINGO COUNTRY	99	15	2	82
Ciudad Colonial	54	14	1	39
BELLA VISTA	119	14	2	103
VILLA AGRICOLAS	109	14	6	89
VIEJO ARROYO HONDO	90	14	2	74
LOS PAREDOES	49	14	1	34
MADRE VIEJA SUR	75	14	0	61

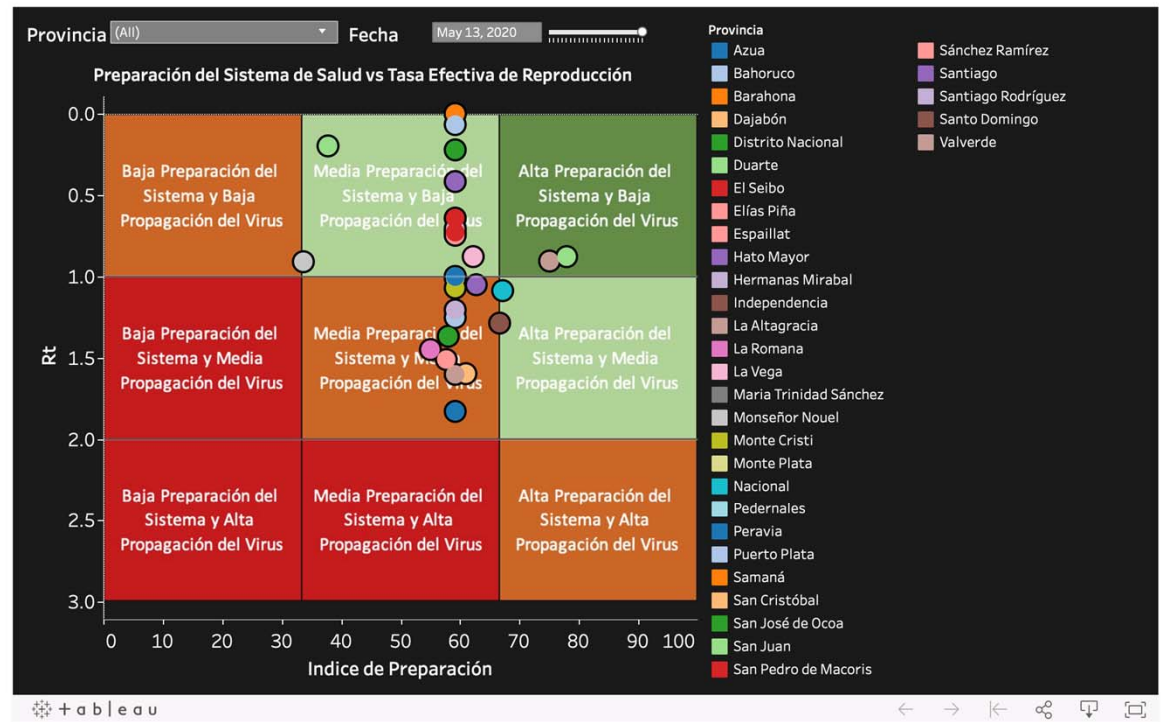


# PLATAFORMA DE ANALISIS APERTURA ECONOMICA USANDO MCKINSSEY FRAMEWORK Y TABLEAU



La inauguración fue encabezada por el presidente de

## Plataforma C5i podrá predecir picos de Covid



## DECISION SCIENCE

How machines are assisting leaders in solving problems that have traditionally relied on human judgment, intuition and experience.

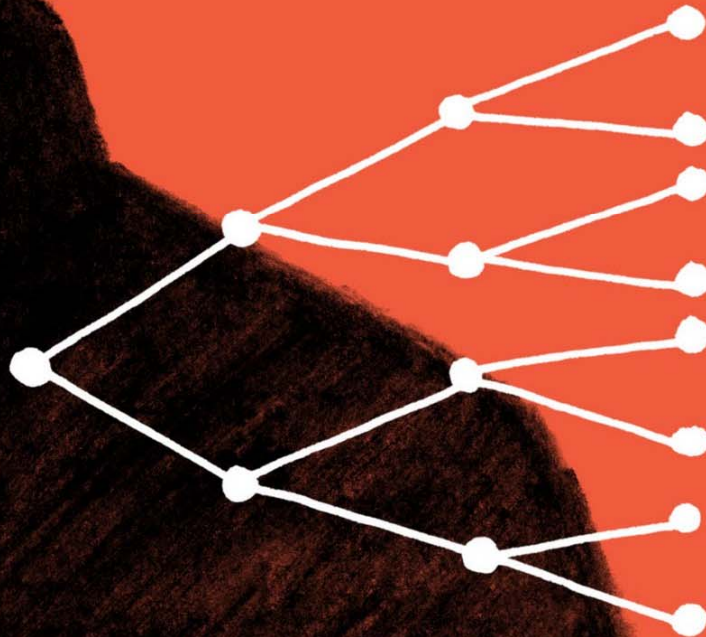
‘Decision science’ encapsulates how computers are helping to systematically identify risks and rewards pertinent to make a business decision.



**ACUTE CARE DIAGNOSTICS  
COLLABORATION**

# ABOUT BAYES THEOREM

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$



## CLINICAL APPLICATIONS

Integrates probability/ prevalence of a  
disease

+

Likelihood ratios (Integrations of Sensitivity  
and Specificity)

Calculation gives you probability that a  
disease can be "ruled in" or "Ruled out"  
based on the specifics of the patient and the  
chosen tests.

LETS THINK A BIT: WHY  
ORDER A CHEST XRAY FOR  
CHEST PAIN?

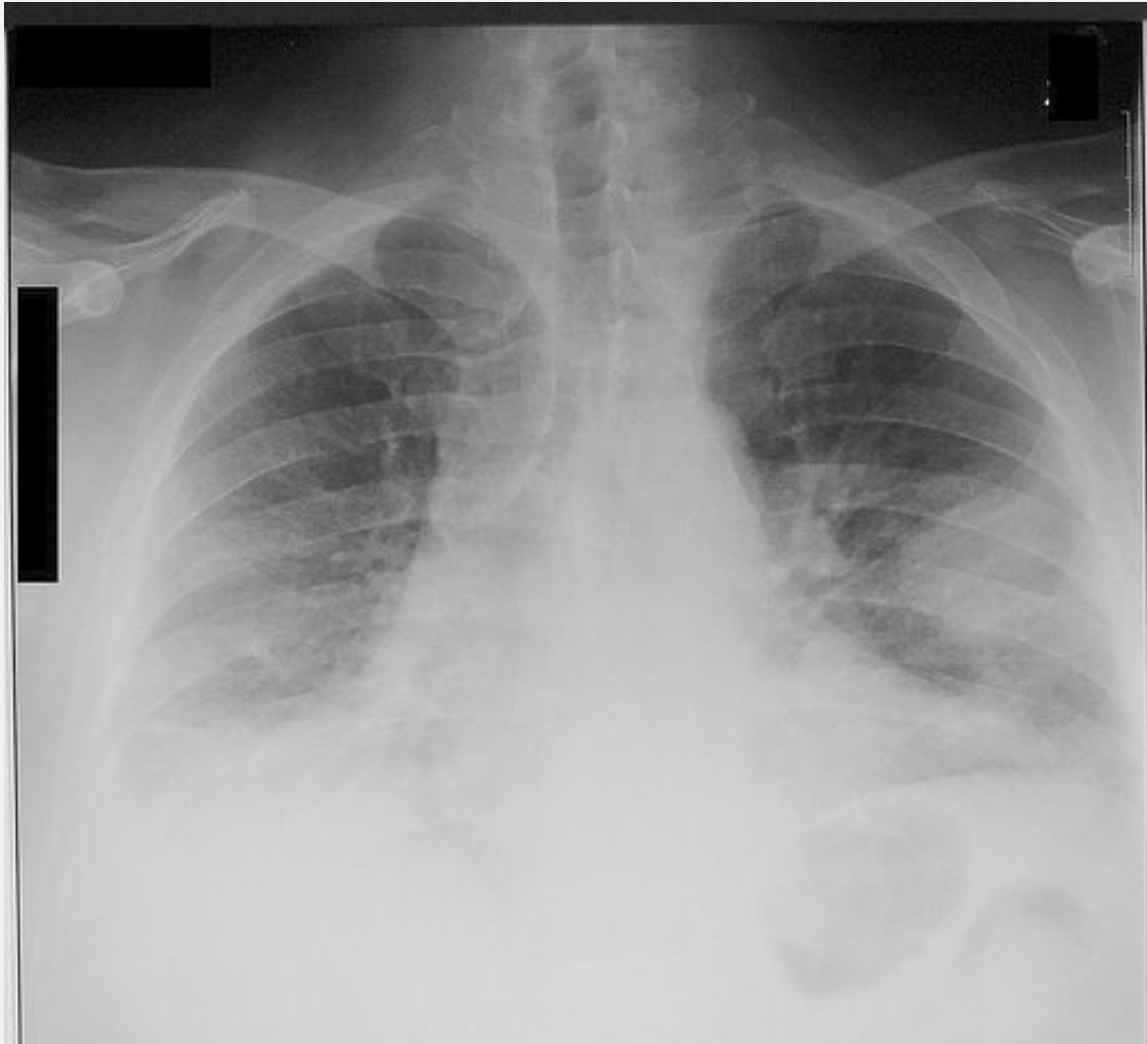
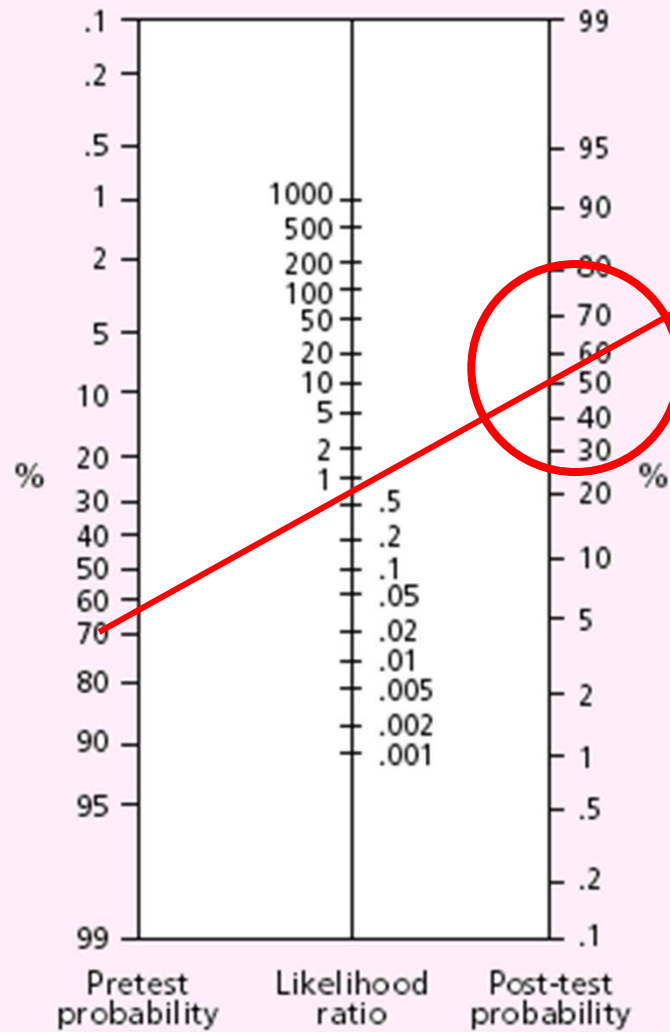


Fig. 2

### Bayes' nomogram

Pre-test probability is located on the first axis and joined to the appropriate likelihood ratio on the second axis. The post-test probability is then read off the third axis.



# CTA PE

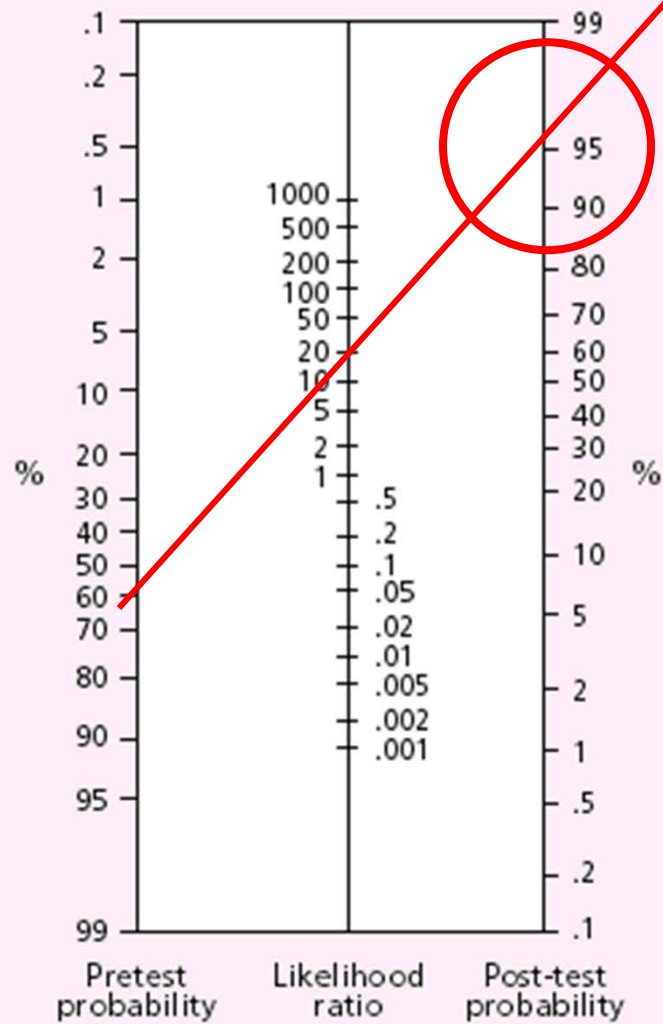




Fig. 2

### Bayes' nomogram

Pre-test probability is located on the first axis and joined to the appropriate likelihood ratio on the second axis. The post-test probability is then read off the third axis.



$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

# ACUTE CARE DIAGNOSTICS COLLABORATION ACDC



**Jackson**  
MEMORIAL HOSPITAL  
Jackson Health System



UNIVERSITY OF MIAMI  
MILLER SCHOOL  
of MEDICINE



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## Acute Care Diagnostics Collaboration (ACDC)

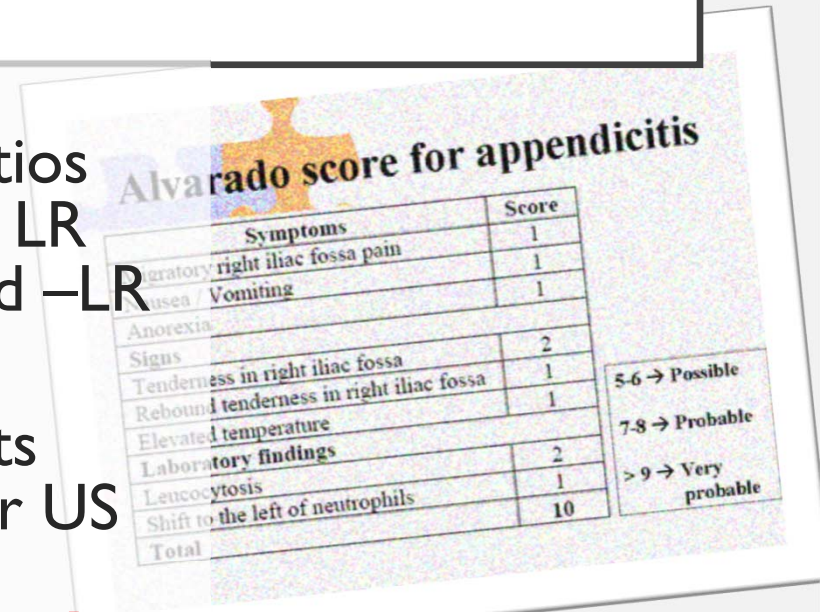
### Acute Care Diagnostics Collaboration (ACDC)

The ACDC is a multinational effort that looks at integrating Bayesian theory and statistical modeling on pretest probability with Emergency Medicine Clinical Decision Rules, combined with assessments on diagnostic quality and cost effectiveness in diverse clinical tools in various patient populations. ACDC has been validated and presented at important international academic forums, such as the American College of Emergency Physicians (ACEP.org) Research Forum, the American Academy of Emergency Medicine (AAEM.org) scientific assembly, the Mediterranean and Inter-American congresses on Emergency Medicine and the International Trauma, Emergency and Critical Care (ITECC2014.com) Symposium. Currently ACDC is expanding into developing models for Disaster/Prehospital Care, Sepsis, Trauma and Critical Care.

[http://en.wikipedia.org/wiki/Bayes'\\_theorem](http://en.wikipedia.org/wiki/Bayes'_theorem)

## COMPARATIVE ASSESSMENT OF DIAGNOSTIC ACCURACY OF CT SCAN AND ULTRASONOGRAPHY IN THE DIAGNOSIS OF ACUTE APPENDICITIS AFTER THE APPLICATION OF THE ALVARADO SCORING SYSTEM

- 4341 patients from 31 studies  
Calculated positive likelihood ratios (LR) for US was 12 and negative LR was 0.18; for CT +LR was 16 and -LR 0.06.
- +LR and low Alvarado risk results yielded a post test probability for US of **83.72% and 87.27%** for CT, intermediate risk gave **95.88% and 96.88%**,
- High risk **99.37% and 99.53%** respectively (no statistical difference!!)
- Demonstrated elevated accuracy of the in high pre-test

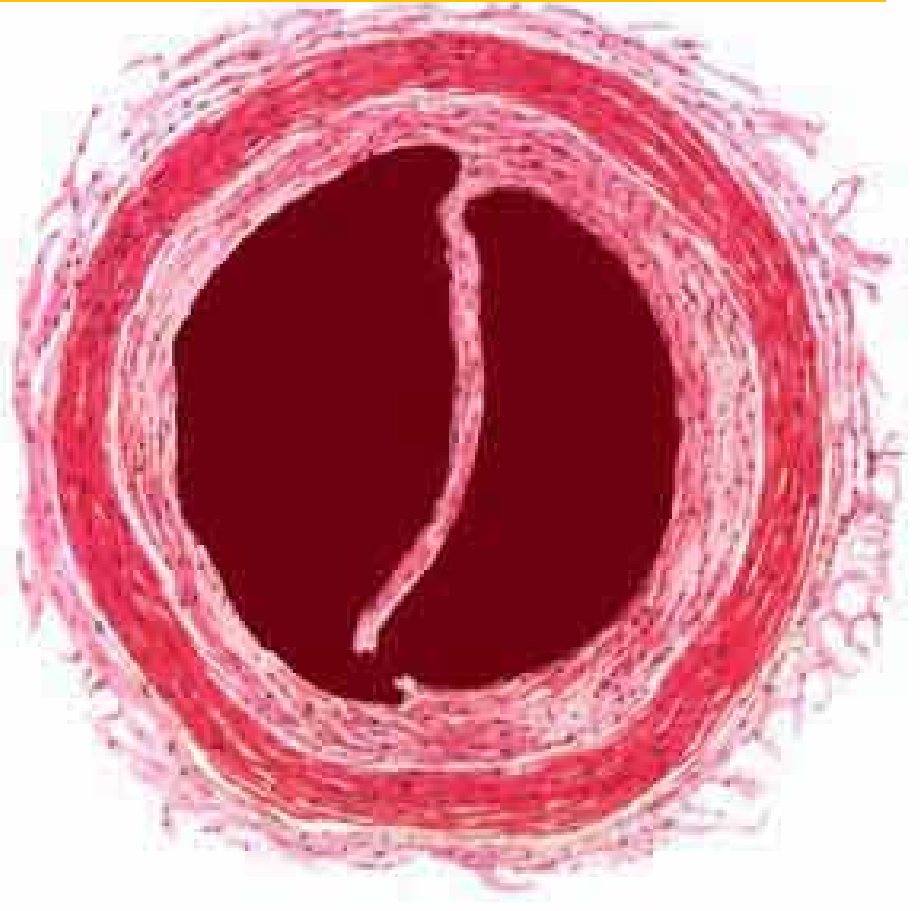
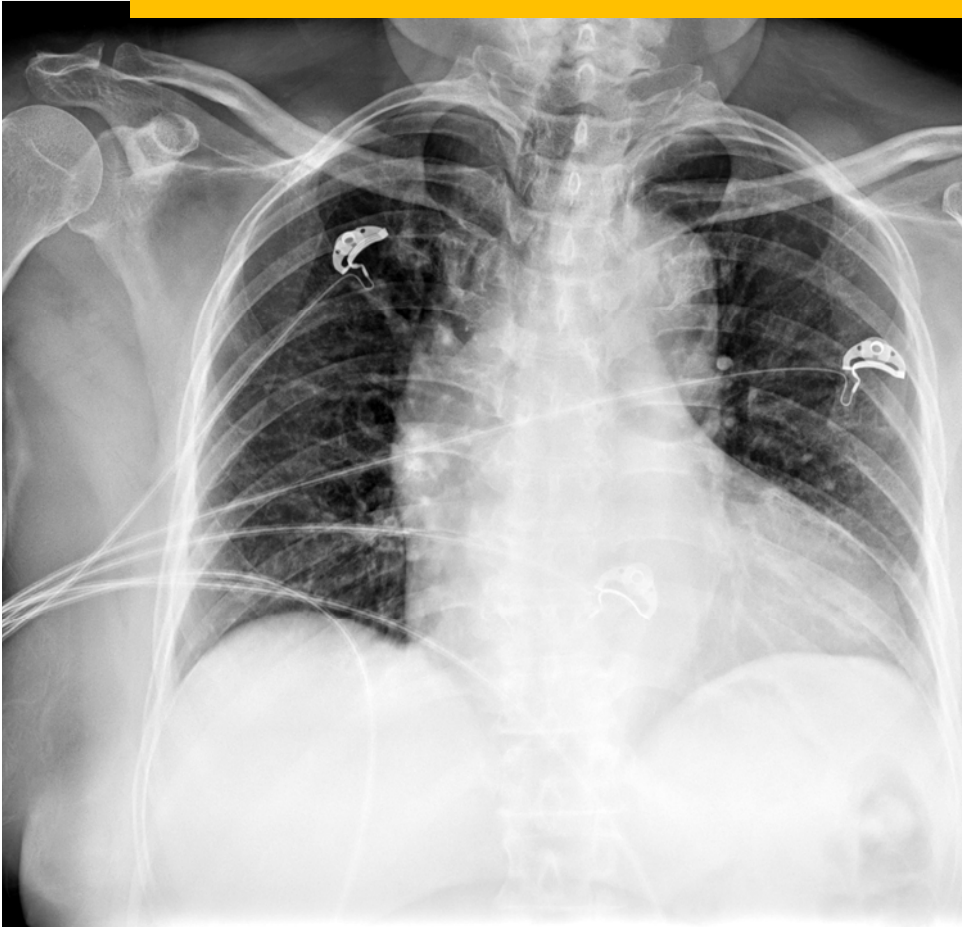


The image shows a table titled "Alvarado score for appendicitis" with a grid of symptoms and scores. To the right of the table is a legend indicating risk levels based on total scores: 5-6 is Possible, 7-8 is Probable, and > 9 is Very probable. The table lists symptoms such as migratory right iliac fossa pain, nausea/vomiting, anorexia, signs like tenderness and rebound tenderness, elevated temperature, laboratory findings like leucocytosis and neutrophil shift, and a total score of 10.

Symptoms	Score
Migratory right iliac fossa pain	1
Nausea / Vomiting	1
Anorexia	
Signs	2
Tenderness in right iliac fossa	1
Rebound tenderness in right iliac fossa	1
Elevated temperature	
Laboratory findings	2
Leucocytosis	1
Shift to the left of neutrophils	
Total	10

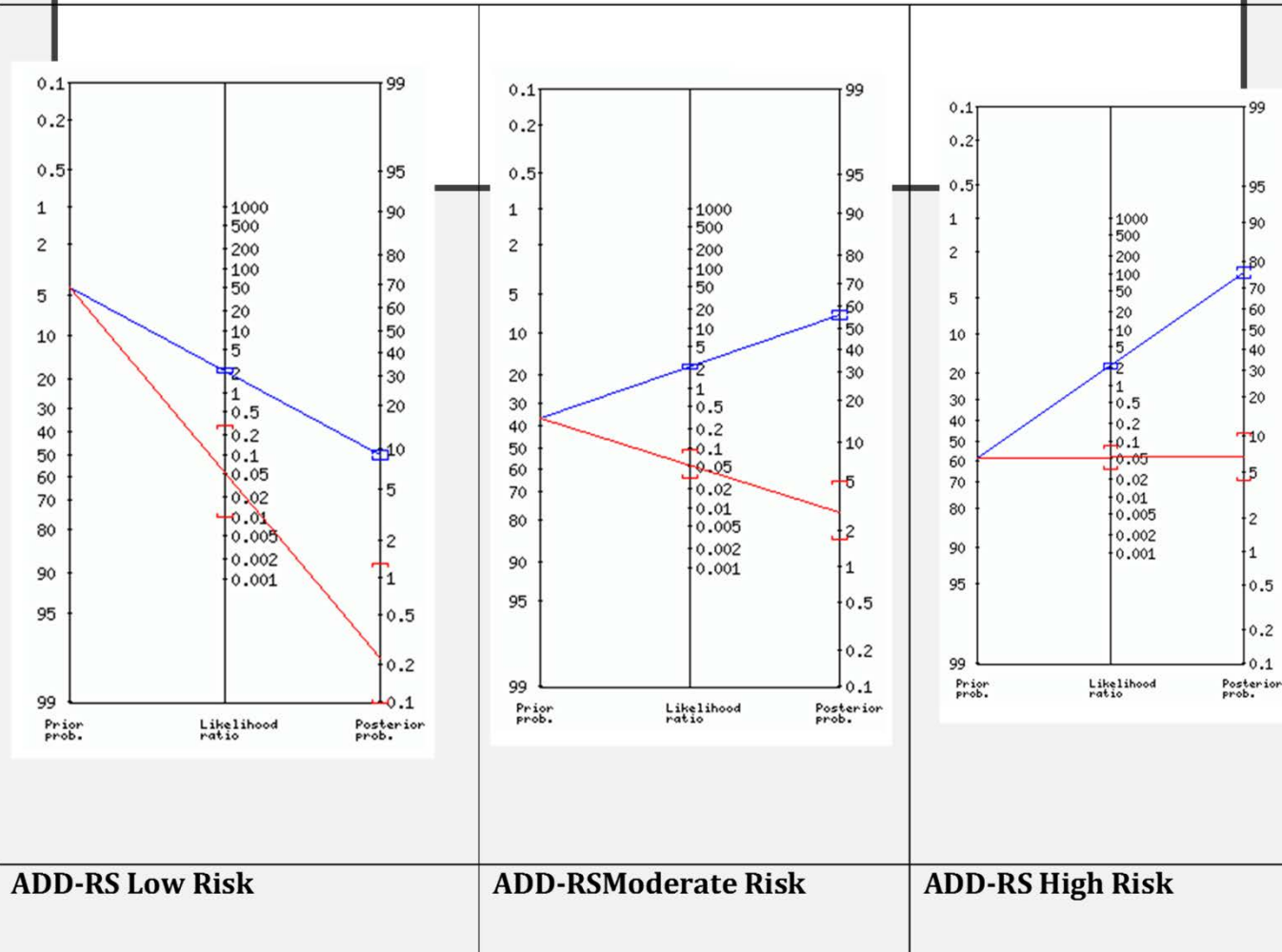
5-6 → Possible  
7-8 → Probable  
> 9 → Very probable

# AORTIC DISSECTION



**Figure 1- Bayesian Nomogram for ADD-RS and D-Dimer.**

**Positive Likelihood Ratios (blue) Negative Likelihood ratios (red)**



## **IMPROVED RULE OUT DIAGNOSTIC GAIN WITH A COMBINED AORTIC DISSECTION DETECTION RISK SCORE AND D-DIMER BAYESIAN DECISION SUPPORT SCHEME**

- ADD risk score low risk pretest probability (ADD-RS of 0) as 4.3%, Intermediate 36.5% (ADD-RS of 1) and high risk 59.2% (ADD-RS of 2 or 3).
- Pool D-Dimer data demonstrated Negative LR (0.06, 95% CI 0.03 to 0.12), positive LR (2.43, 95% CI 1.89 to 3.12).
- Bayes modeling for Negative Likelihood ratios demonstrated posttest probabilities score of 0.24% for Low Risk (ADG = 4.06% and RDG= 94.42%), 3.4% for Intermediate Risk (ADG = 33.1% and RDG= 90.68%) and 7.9% for High Risk (ADG = 51.3% and RDG= 86.65%).

**COMBO ADD RISK SCORE AND D-DIMER TESTING YIELDED  
IMPORTANT RULE-OUT GAINS, MOSTLY EVIDENCED IN THE ADD-RS  
LOW AND INTERMEDIATE PRETEST PROBABILITY CATEGORY**



Int J Cardiol. 2014 Jul 15;175(1):78-82. doi: 10.1016/j.ijcard.2014.04.257. Epub 2014 May 2.

## Combined use of aortic dissection detection risk score and D-dimer in the diagnostic workup of suspected acute aortic dissection.

Nazerian P<sup>1</sup>, Morello F<sup>2</sup>, Vanni S<sup>1</sup>, Bono A<sup>3</sup>, Castelli M<sup>1</sup>, Forno D<sup>3</sup>, Giqli C<sup>1</sup>, Soardo F<sup>3</sup>, Carbone F<sup>3</sup>, Lupia E<sup>3</sup>, Grifoni S<sup>1</sup>.

### ⊕ Author information

#### Abstract

**BACKGROUND:** Acute aortic dissection (AD) represents a diagnostic conundrum. Validated algorithms are particularly needed to identify patients where AD could be ruled out without aortic imaging. We evaluated the diagnostic accuracy of a strategy combining the aortic dissection detection (ADD) risk score with D-dimer, a sensitive biomarker of AD.

**METHODS:** Patients from two clinical centers with suspected AD were prospectively enrolled in a registry, from January 2008 to March 2013. The ADD risk score was calculated by retrospective blinded chart review. For D-dimer, a cutoff of 500 ng/ml was applied.

**RESULTS:** AD was diagnosed in 233 of 1035 (22.5%) patients. The ADD risk score was 0 in 322 (31.1%), 1 in 508 (49.1%) and >1 in 205 (19.8%) patients. The sensitivity and the failure rate of D-dimer were 100% and 0% in patients with ADD score 0, versus 97.5% (95% CI 91.4-99.6%) and 4.2% (95% CI 0.7-12.5%) in patients with ADD risk score >1. In patients with ADD risk score ≤ 1, the sensitivity and the failure rate of D-dimer were 98.7% (95% CI 95.3-99.8%) and 0.8% (95% CI 0.1-2.6%). The diagnostic efficiency of D-dimer in patients with ADD risk score 0 and ≤ 1 was 8.9% (95% CI 7.2-10.7%) and 23.6% (95% CI 21.1-26.2%) respectively.

**CONCLUSIONS:** In a large cohort of patients with suspected AD, the presence of ADD risk score 0 or ≤ 1 combined with a negative D-dimer accurately and efficiently ruled out AD.

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**KEYWORDS:** Aortic dissection; D-dimer; Diagnosis

PMID: 24838058 [PubMed - indexed for MEDLINE]

ÍNDICE DE VULNERABILIDAD  
COMPUESTO.

IVC COV2

RIESGO DE MUERTE.

SISALRIL

(PL CASTELLANOS, RAMIREZ-SLAIBE, L MARTINEZ)

# FUENTES DE INFORMACIÓN

1 Seguro Familiar de Salud

2 Ministerio de Salud

3 Servicio Nacional de Salud

4 C5i

# IVC COV2: ESTRUCTURA Y COMPOSICIÓN

## Índice Vulnerabilidad Compuesto

IVC Cov2

Dimensión 1:  
Comorbilidades

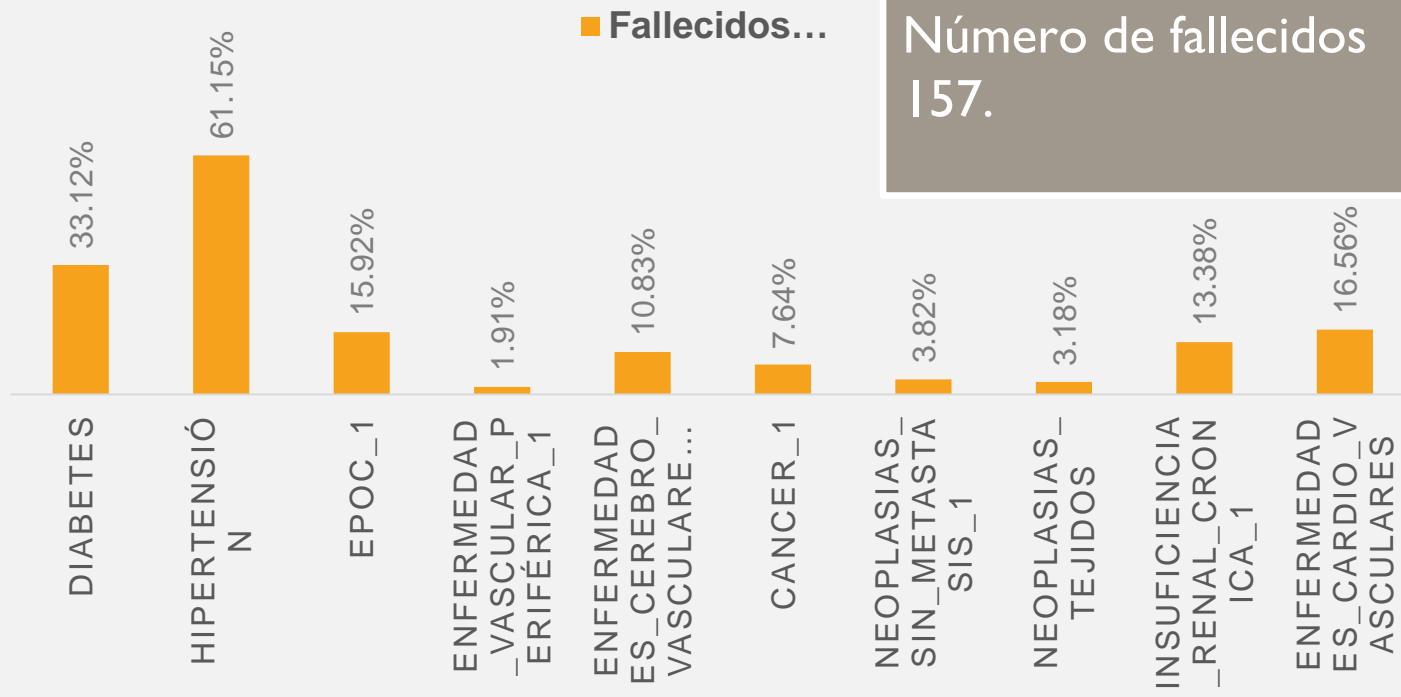
Dimensión 2:  
Edad

Dimensión 3:  
Sexo

Dimensión 4:  
Composición  
del Núcleo  
Familiar.

$$IVCCoV2 = .3D1 + .3D2 + .3D3 + .1D4$$

DIMENSIÓN I: COMORBILIDADES  
FALLECIDOS POR COVID19 SEGÚN COMORBILIDAD  
IDENTIFICADA DENTRO DEL SFS



## RESULTADO: IVC-COV2

IVC-COV2 RIESGO	Población Vulnerable	VIVOS	FALLECIDOS OBSERVADOS POR COVID 19	Porcentaje de Fallecidos por Covid 19 Observados según Riesgo IVC-COV2
<b>Total</b>	<b>1,055,745</b>	<b>1,055,588</b>	<b>157</b>	<b>100.00%</b>
RIESGO BAJO	393,459	393,456	3	1.91%
RIESGO MEDIO	395,172	395,131	41	26.11%
RIESGO ALTO	267,114	267,001	113	71.97%

**A Bayesian Enhanced Population-Based Model for COVID-19 Critical Care Prediction for Dominican Republic Social Security Affiliates**

Amado Alejandro Baez (1,2), Oscar Lopez (1), Maria del Pilar Martinez (3), Pedro Ramirez Slaibe (4), Leticia Martinez (4), Pedro Luis Castellanos (4)

1-Medical College of Georgia Department of Emergency Medicine

2-Universidad Nacional Pedro Henriquez Ureña (UNPHU) Postgraduate Studies

3-Washington University College of Medicine

4-Superintendencia de Salud y Riesgos Laborales (SISALRIL)

Dominican Republic

**Contact**

Amado Alejandro Baez

Department of Emergency Medicine- Medical College of Georgia

And UNPHU Postgraduate Studies and Institute for Public Health

[aabaezmd@gmail.com](mailto:aabaezmd@gmail.com)

**Key words: COVID-19, population-based, risk, Intensive Care, ICU**

**DETERMINACION DE NECESIDAD  
DE CAMA UCI BASADO EN MODELO  
HIBRIDO-BAYESIANO**

**Table 5 – IVC-COV2 and NEWS Score  $\geq 5$  Bayesian Analysis Results**

	Pretest	Post test	Absolute Gain	Relative Gain
IVC-COV2	1.91%	LR (+) 7.0	LR (+) 5.09%	LR (+) 266.49%
Low + NEWS-2 Score		LR (-) 1.0	LR (+) 0.91%	LR (+) 47.64%
IVC-COV2	26.11%	LR (+) 58.0	LR (+) 31.89	LR (+) 122.14%
<b>Intermediate</b> <b>+NEWS-2 Score</b>		LR (-) 9.0	LR (-) 17.11	LR (-) 65.53
IVC-COV2	71.97%	LR (+) 91.0	LR (+) 19.03	LR (+) 26.44
High + NEWS-2 Score		LR (-) <u>43.0</u>	LR (+) <u>28.97</u>	LR (+) <u>40.25%</u>
* LR (+): Positive Likelihood Ratio				
* LR (-): Negative Likelihood Ratio				

**Table 6 - Bayesian Number Needed to Diagnose**

Pre-test Probability	Post- test LR (+)	ADG	NND
(Intermediate only)			
<b>IVC-COV2 (26.11%)</b>	NEWS2 58	31.89%	<b>3.13 (3 rounded)</b>
* LR (+): Positive Likelihood Ratio			
* ADG: Absolute Diagnostic Gain			





**THANK YOU**  
[Aabaezmd@gmail.com](mailto:Aabaezmd@gmail.com)  
**Twitter/IG: AleBaezMD**