

The background of the slide features a large, faint watermark of the Rutgers University seal. The seal is circular with a sunburst in the center and the words "RUTGERS UNIVERSITY" and "THE STATE UNIVERSITY OF NEW JERSEY" around the perimeter.

**RUTGERS**

THE STATE UNIVERSITY  
OF NEW JERSEY

# **Continuous Audit & Monitoring Application Under Pandemic Circumstances**

Presented by

Wenru Wang – Rutgers University

50th WCARS Symposium

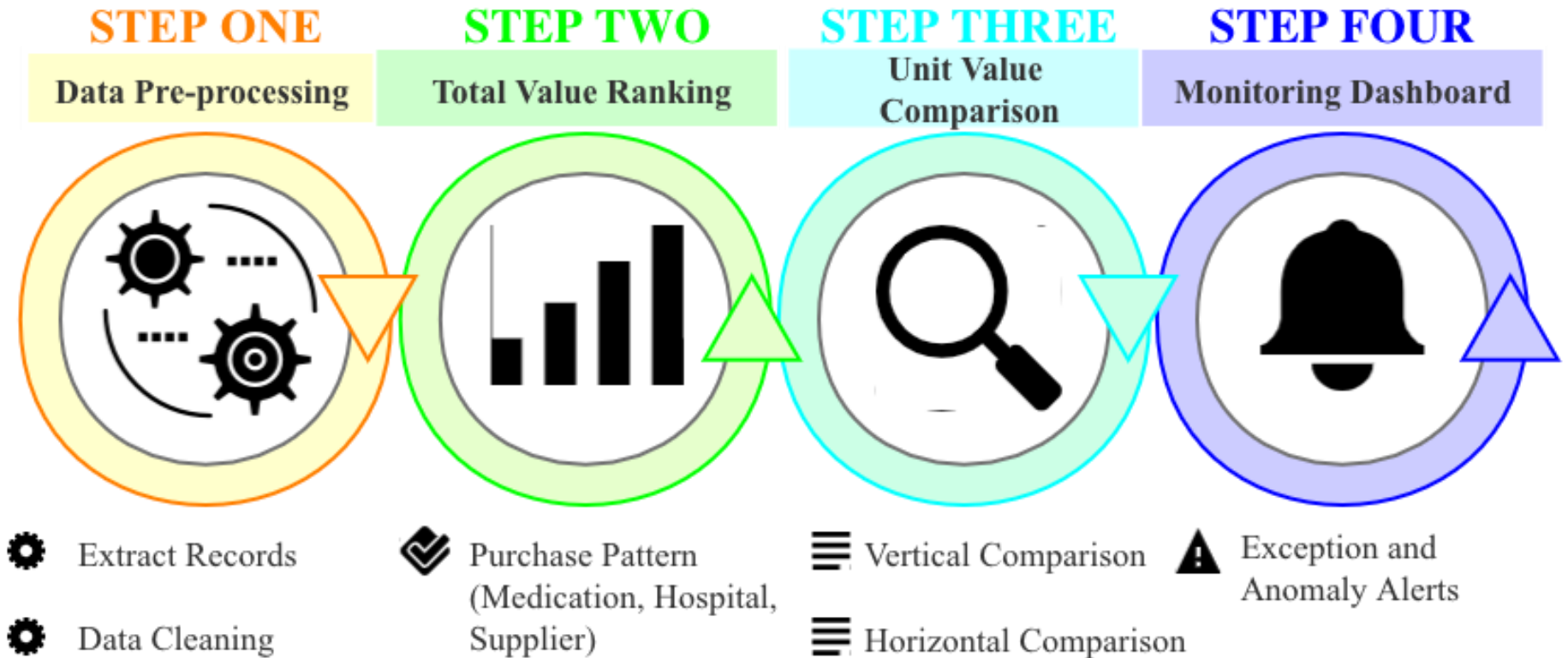
Nov. 7, 2020

# Introduction

- The CARES Act established the US\$150 billion Coronavirus Relief Fund for state and local governments (*US Treasury, 2020*).
- Brazil announced economic stimulus package with US\$ 17.5 billion financial support to states.
- How does the government spend the fund?
  - Electronic procurement system: Data quality issues
  - Governmental audit: Time lagging of anomaly detection
- We propose a continuous audit methodology that helps internal auditors monitor and analyze government procurement data on a more timely basis.

# Overview

- Medication procurement data: 30,000+ records for 2017 – 2019; 7,000+ for 2020.



# Total Value Ranking

- Identify top purchased medications in 2020 and compare to the top purchases in 2017-2019.
- 10 of 20 top purchase in 2020 are not shown before.

best_match_score	rank2020	Rank	Mater Cd	Material_left	Descricao Material_left	value_left	value_right
NaN	202003	NaN	65050810663	CLARITROMICINA, LACTOBIONATO		9,669,593	NaN
NaN	202004	NaN	65050824028	MEROPENEM		8,007,583	NaN
NaN	202006	NaN	65050201640	FENTANILA		6,746,101	NaN
NaN	202007	NaN	65052200153	ATRACURIO, BESILATO		6,549,238	NaN
NaN	202008	NaN	65050800862	CEFTRIAXONA		5,851,312	NaN
NaN	202009	NaN	65052601050	NOREPINEFRINA (NORADRENALINA)		5,105,944	NaN
NaN	202013	NaN	65050801249	CEFAZOLINA		3,342,956	NaN
NaN	202016	NaN	65052901704	DIPROPIONATO, BECLOMETASONA		2,534,314	NaN
NaN	202017	NaN	65054200304	BICARBONATO, SODIO		2,501,535	NaN
NaN	202020	NaN	65050902193	ENOXAPARINA SODICA		2,112,100	NaN

	best_match_score	rank2020	Rank	Mater Cd	Material_left	Descricao Material_left	value_left	value_right
0	0.049712	202001	201712.0		65050900735	ENOXAPARINA SODICA	14,814,514	2,615,733
1	0.049712	202001	201804.0		65050900735	ENOXAPARINA SODICA	14,814,514	3,253,807
31	0.049712	202019	201814.0		65053300151	ALBUMINA HUMANA	2,179,018	2,093,504
30	0.049712	202019	201711.0		65053300151	ALBUMINA HUMANA	2,179,018	2,653,568
29	0.049712	202018	201915.0		65051601352	IBUPROFENO	2,386,302	1,904,973
26	0.049712	202015	201815.0		65052601492	SUGAMADEX SODICO	2,632,738	2,054,257
25	0.049712	202015	201718.0		65052601492	SUGAMADEX SODICO	2,632,738	2,061,186
24	0.049712	202014	201914.0		65055500158	SINVASTATINA	2,660,081	2,056,650
23	0.049712	202014	201809.0		65055500158	SINVASTATINA	2,660,081	2,612,366
22	0.049712	202014	201707.0		65055500158	SINVASTATINA	2,660,081	3,156,848
20	0.049712	202012	201903.0		65054207155	CLORETO, SODIO	3,944,073	3,416,970
19	0.049712	202012	201807.0		65054207155	CLORETO, SODIO	3,944,073	2,926,380
18	0.049712	202012	201703.0		65054207155	CLORETO, SODIO	3,944,073	3,790,623
17	0.049712	202011	201908.0		65050820464	CIPROFLOXACINO SISTEMA FECHADO	4,186,409	2,602,302
16	0.049712	202011	201802.0		65050820464	CIPROFLOXACINO SISTEMA FECHADO	4,186,409	3,584,739
15	0.049712	202011	201710.0		65050820464	CIPROFLOXACINO SISTEMA FECHADO	4,186,409	2,684,804
14	0.049712	202010	201916.0		65050901108	ALTEPLASE	4,766,701	1,879,796
9	0.049712	202005	201905.0		65050811442	TAZOBACTAM SODICO	7,902,568	3,239,413
8	0.049712	202005	201806.0		65050811442	TAZOBACTAM SODICO	7,902,568	3,103,899
7	0.049712	202005	201709.0		65050811442	TAZOBACTAM SODICO	7,902,568	2,793,304
4	0.049712	202002	201909.0		65050811685	AMOXACILINA	10,507,777	2,406,964
3	0.049712	202002	201719.0		65050811685	AMOXACILINA	10,507,777	2,044,864
2	0.049712	202001	201902.0		65050900735	ENOXAPARINA SODICA	14,814,514	3,901,548
32	0.049712	202019	201918.0		65053300151	ALBUMINA HUMANA	2,179,018	1,720,201

## Unit Price Comparison

- **Vertical comparison:** compare purchases of same medication within PRJ, identify medications that have large unit price variations.



### 3. Unit Price Comparison

- Hypothetical price savings

Mater Cd Material	Descricao ao Ma..	Nome Favor	Nm Orgao	Avg. VI Unitario..	Qt Item Material	VI Total Aquisicao
65050810663	CLARITROMI CINA, LACTO BIONATO	AVANTE BRASIL COMERCI..	Hospital Municipal Nossa ..	56.82	150	8,523
		COSTA CAMARGO	Empresa Pública de Saúde..	38.00	209,200	7,949,600
		COMERCIO DE PRODUTOS HOSPITALARES LTDA	Secretaria Municipal de S..	33.93	27,431	930,734
			Hospital Municipal Souza ..	33.93	1,125	38,171
			Hospital Municipal Salgad..	33.93	2,600	88,218
			Hospital Municipal Nossa ..	33.93	472	16,015
			Hospital Municipal Miguel..	33.93	800	27,144
			Hospital Municipal Franci..	33.93	215	7,295
			Hospital Municipal de Pie..	33.93	200	6,786
			Hospital Maternidade Her..	33.93	30	1,018
			Hospital Maternidade Fer..	33.93	200	6,786
			Hospital Maternidade Ale..	33.93	264	8,958
		UNIQUE DISTRIBUIDORA DE MEDICAMENTOS EIRELI	Secretaria Municipal de S..	33.93	1,808	61,345
			Empresa Pública de Saúde..	30.00	17,300	519,000

	Total acquisition value	Savings
Using original unit price	7,949,600	R\$ 851,444
Using lowest unit price (33.93)	7,098,156	



### 3. Unit Price Comparison

- **Horizontal comparison:** compare to federal catalog prices, to detect price savings opportunity
- Municipal catalog and federal catalog do not share material codes
- Fuzzy matching

best_match_score	Codigo_Material	codigo	Descricao_Material	descricao	Descricao_Complemento_1	Descricao_Complemento_2
165923	0.791579	65059045377	135305.0	NISTATINA + OXIDO DE ZINCO	NISTATINA + OXIDO DE ZINCO, NISTATINA + OXIDO ...	60MG ...
170463	0.722223	65059065103	114995.0	BISACODIL + DOCUSATO, SODICO	DOCUSATO SODICO + BISACODIL, DOCUSATO SODICO +...	5 MG + 60 MG COMPRIMIDO ...
201973	0.666962	65059250946	87459.0	VITAMINAS DO COMPLEXO B	VITAMINAS DO COMPLEXO B, VITAMINA DO COMPLEXO ...	TIAMINA, CLORIDRATO (VITAMINA B1) 10 MG + RIBO...
206051	0.657359	65059261638	275989.0	SACCHAROMYCES BOULARDII-17 200	SACCHAROMYCES BOULARDII - 17, DOSAGEM 200 MG	SACCHAROMYCES BOULARDII-17 200 MG ...
40898	0.654455	65054201386	116491.0	LIPIDIO, OLEO SOJA	LEVANLODIPINO BESILATO, LIPIDIO - OLEO SOJA NOME	10%, NUTRICA O PARENTAL, FR 100ML ...
...	...	...	...	...	...	...
265116	NaN	65059406628	NaN	FOTOPROTETOR	NaN	FPS 30, PELE MORENA, BI 40G ...
275248	NaN	65059416690	NaN	COBALAMINA 5000MCG	NaN	MANIPULADO ...
277807	NaN	65059420531	NaN	PYCNOGENOL	NaN	LOCAO ...
278844	NaN	65059422402	NaN	PERMUTADOR CALOR/UMIDADE	NaN	TRAQUEOSTOMIA ...
279260	NaN	65059423204	NaN	PROPAMIDINA	NaN	0,1%, SOLUCA O OFTALMICA, FR 3ML ...

7699 rows × 7 columns

## Takeaways...

- Propose a continuous audit methodology to improve the efficiency of government procurement under the current pandemic.

# Thank you!

[ww321@rutgers.edu](mailto:ww321@rutgers.edu)