



# Use of Social Networks for Measuring Perception of Discrimination Using NLP Models

**DANE - Data4Now Initiative**





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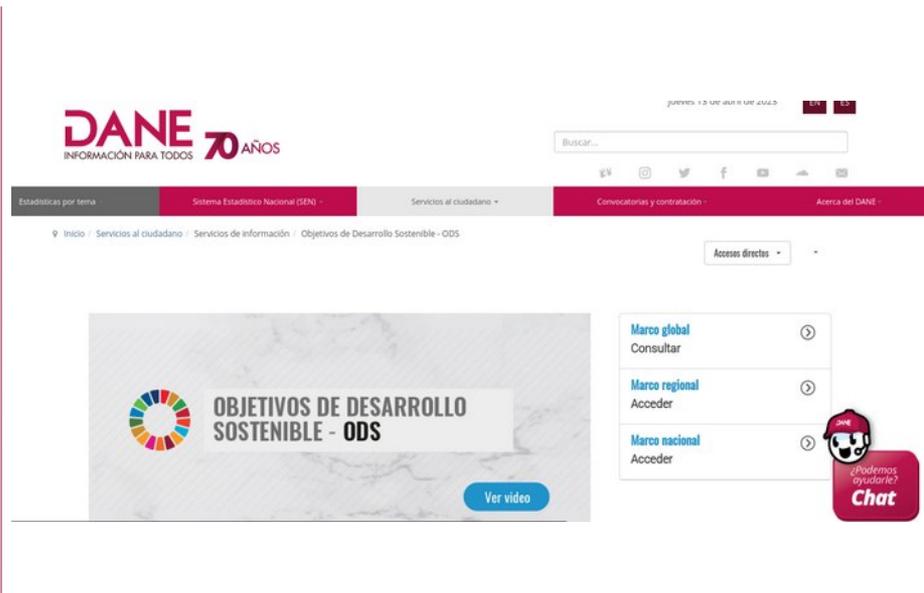


# Requeriments of information

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1. The project responds to a data gap, identified in a policy document CONPES 3918 - 2018, which implement the 2030 Agenda in the Colombian Context
2. The project is articulated with the DANE's experimental statistics initiative, which seeks for new methods and data sources to improve official statistics.
3. DANE has experienced working with SDGs and alternative data. Currently DANE estimates several indicators from SDGs 11 using machine learning techniques and satelital images.
4. DANE received support from Data4Now initiative to carry out this project.





# Methodology

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## SDG 16 Indicators calculations using social media



### Objective

Obtain complementary measurements of the Indicators of SDG16, associated with discrimination perception through Facebook.

- SDG 10.3.1/ 16.b.1 Rate of population that declares being feltt personally discriminated in the last 12 months.
- SDG 16.7.2 Rate of the population that believes that decisión making is inclusive, receptive, by sex, age, disability and Group of population.

Fuente: DANE.

### Webscrapping collection period.

- 2013-2022.

### Sample

- Discrimination: 719.902 comments  
8.744 comments with prob.>0.5  
503.553 users  
8.177 com. Users with prob. >0.5
- Inclusiveness: 187.995 comments  
62.000 comments with prob >0.6  
124.302 users  
50.794 com. Users with prob >0.6
- Responsiveness: 583.507 comments  
275.360 comments with prob .>0.6  
405.693 users  
219.372 com. Users with prob >0.6

## Quality assurance strategy

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### *Collection quality*

**Parallel scrapping with several accounts.**

**Demographic Analysis**

### *Modeling quality*

**Unsupervised analysis**

**Supervised analysis**

**Background information from Google News**



## Unsupervised analysis: Zero Shot Classification Model.

The model assigns to each comment a probability of proximity to each form of discrimination. The graph shows comments with a higher probability of finding political discrimination.

	discriminación por discapacidad	discriminación de género	discriminación racial	discriminación económica	discriminación política	discriminación por ser migrante	text	PostDate
1	7.313725e-05	7.992317e-05	4.980348e-05	0.0002337930	0.9992058	5.767244e-05	No entiendo pa...	2021-04-18 11:...
2	2.191590e-04	1.478854e-04	1.739281e-04	0.0001208104	0.9992110	1.272625e-04	El uribismo es ...	2021-03-10 11:...
3	1.389207e-04	1.754443e-04	1.970163e-04	0.0001732407	0.9992149	1.904116e-04	Esto es una mu...	2021-04-08 17:...
4	2.122919e-04	1.832371e-04	1.562001e-04	0.0002633869	0.9990610	1.238259e-04	Acá en Colombi...	2021-05-12 22:...
5	1.479216e-04	2.376094e-04	2.828504e-04	0.0001506104	0.9990255	1.555626e-04	Queda más qu...	2021-05-26 06:...
6	1.409921e-04	3.249850e-04	1.800132e-04	0.0002071087	0.9990246	1.213050e-04	Estamos repitie...	2020-10-01 14:...
7	1.550841e-04	2.514438e-04	2.038144e-04	0.0002125147	0.9989994	1.777028e-04	Y pensar que el...	2016-05-20 23:...
8	8.907890e-05	3.164731e-04	1.551449e-04	0.0003221302	0.9989560	1.602846e-04	Ya sabemos qu...	2021-03-30 10:...
9	3.367275e-04	1.475786e-04	1.097791e-04	0.0003379599	0.9987351	1.331372e-04	Sí una narcodic...	2021-05-11 09:...
10	3.823540e-04	2.782119e-04	1.184698e-04	0.0002144224	0.9985797	1.268794e-04	Álvaro Uribe Vé...	2021-01-09 11:...

Political discrimination:  $p = 0,98$



El uribismo es un partido político que sólo busca generar división en el país, y no unión, desarrollo y prosperidad, es un partido político destructivo, arrogante y maldito en Colombia

Me gusta Responder 48 sem

*“Uribism is a political party that only seeks to generate division in the country, not union, development and prosperity, it is a destructive, arrogant and cursed political party in Colombia.”*



## Main results

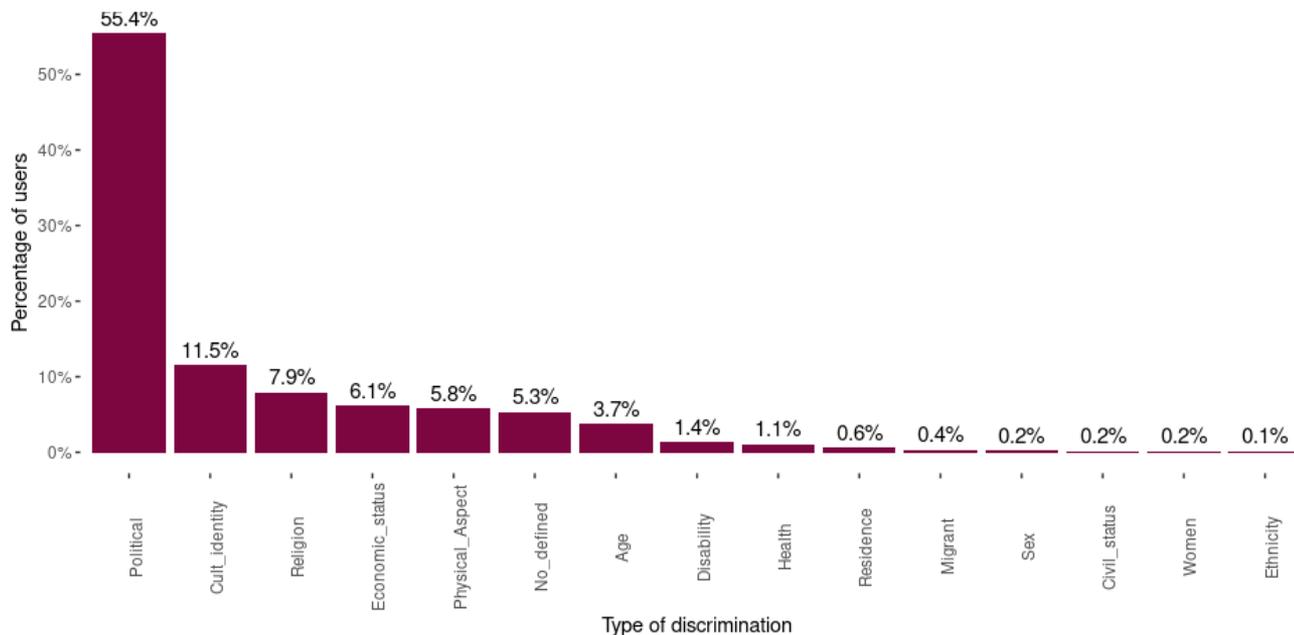
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## SDG 16.b.1. Percentage of users with comments related to discrimination (prob >0.5) 2013-2021



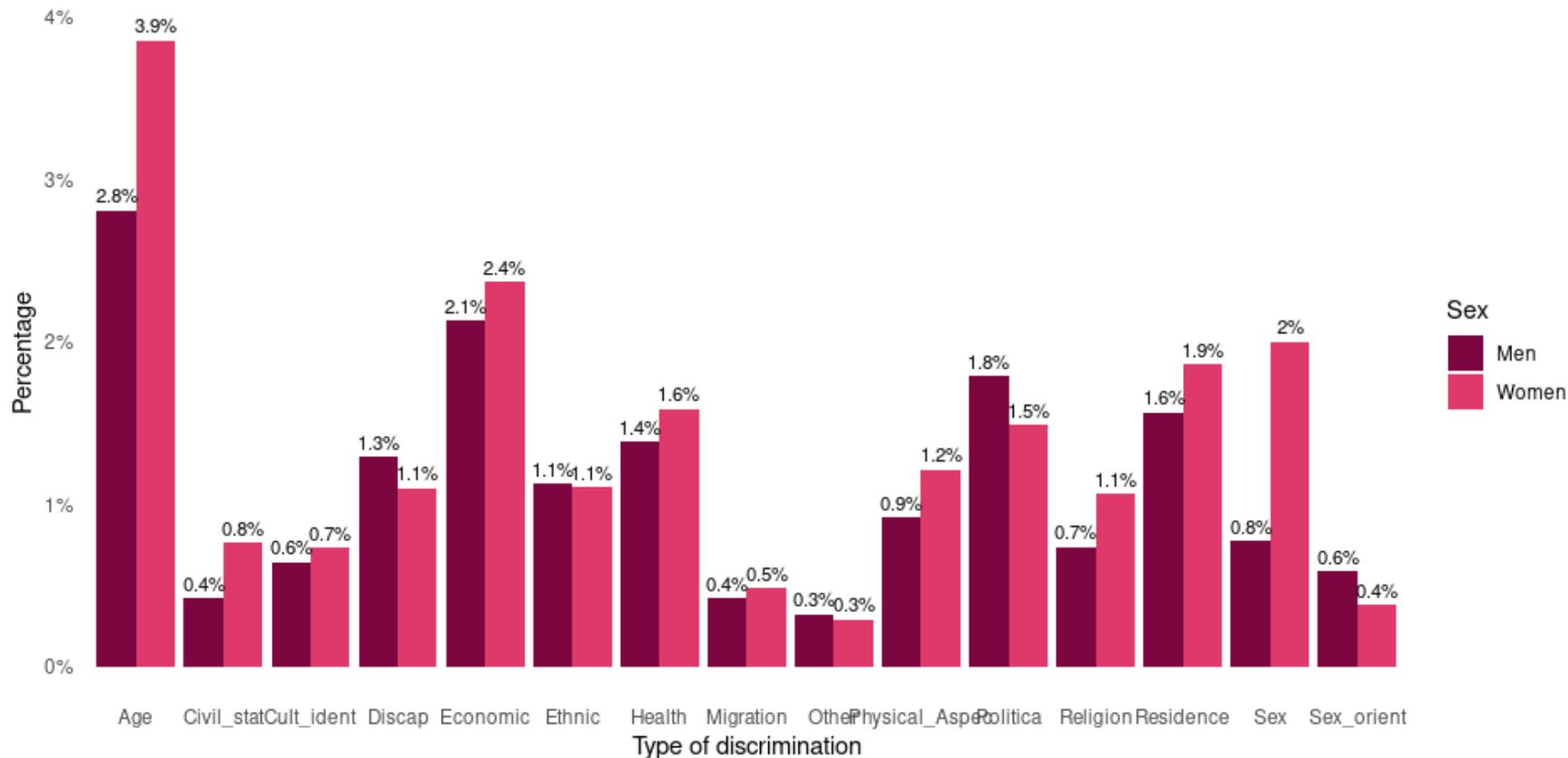
Type of discrimination	Absolute values	Percentage
Religious view	650	7,95%
Disability	111	1,36%
Economic	500	6,11%
Age	306	3,74%
Civil Status	15	0,18%
Ethnicity	940	11,50%
Migrant	30	0,37%
Women	14	0,17%
Non evidenced	432	5,28%
Politics	4.533	55,44%
Physical Features	477	5,83%
Race	12	0,15%
Residence	50	0,61%
Health	87	1,06%
Sex	20	0,24%
Total users	8.177	100,00%

**Source:** DIRPEN-GIT PAD DIRECCIÓN GENERAL-GIT ODS

Users are all those who have made a comment, categorized under any of the forms of discrimination. There may be cases of users who made comments on more than one form of discrimination, so each of these facts should be considered as a single case, even if the author of the comment is the same.



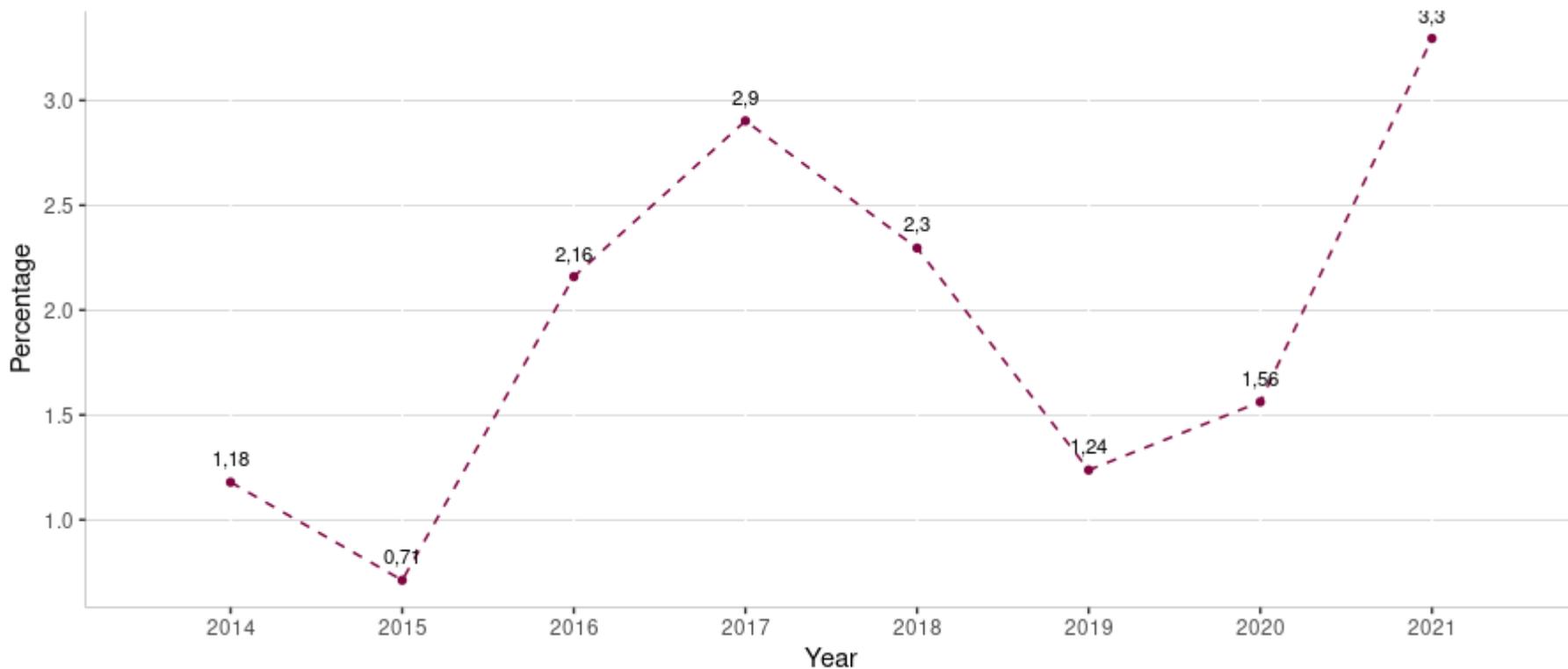
## SDG16.b.1. Percentage of users with comments related to discrimination (prob >0.5), by type of discrimination, by sex, 2013-2021



Source: DIRPEN-GIT PAD DIRECCIÓN GENERAL-GIT ODS



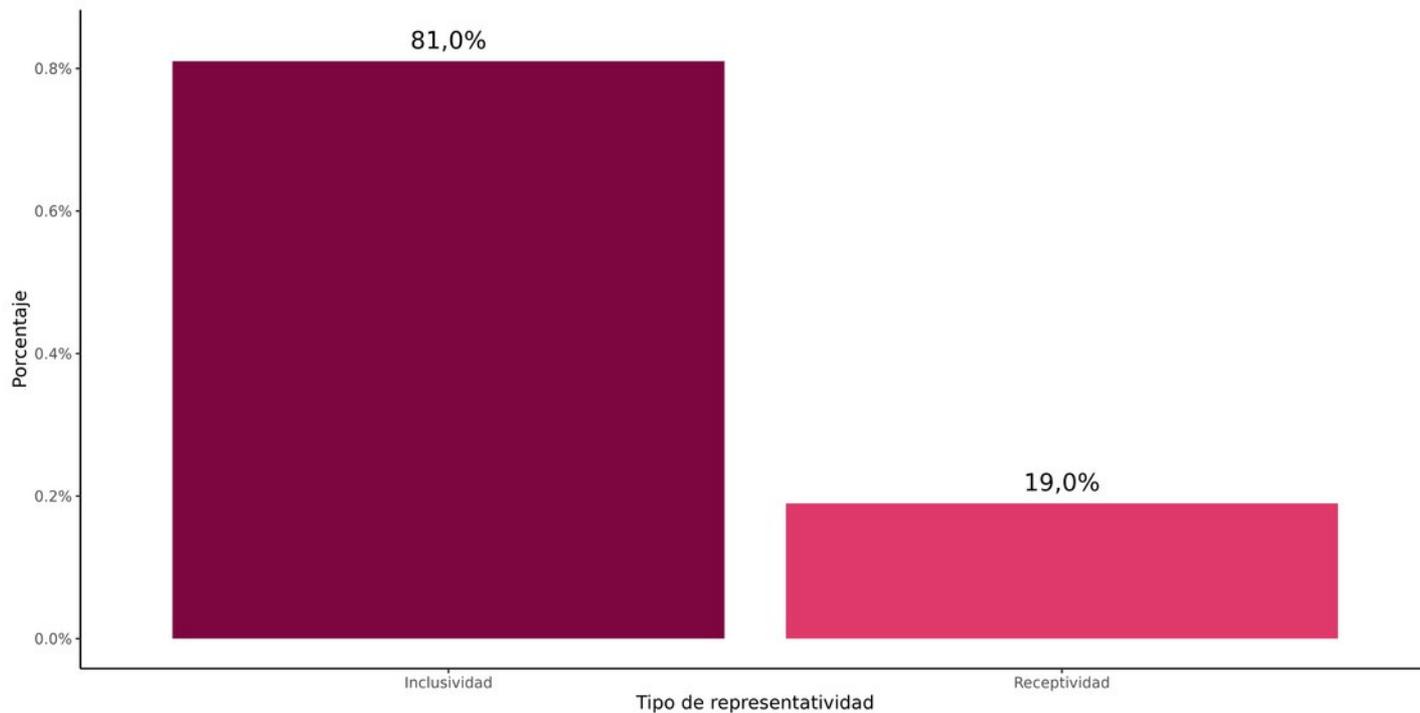
## SDG16.b.1. Percentage of users with comments related to discrimination (prob >0.5), by year. 2013-2021



Source: DIRPEN-GIT PAD DIRECCIÓN GENERAL-GIT ODS



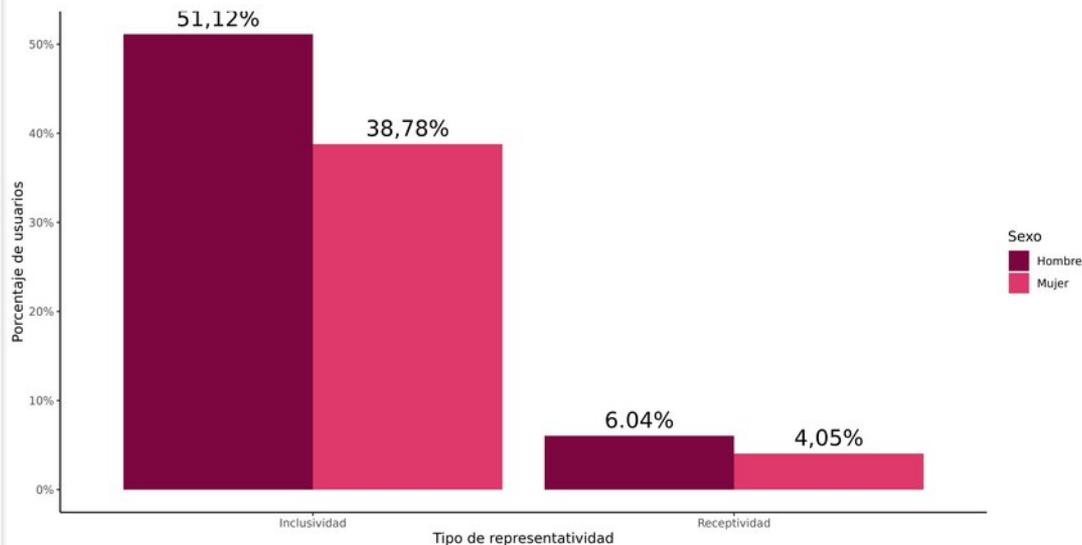
## SDG 16.7.2. Users, by type of representativeness (inclusive and responsive). 2013-2021



Source: DIRPEN-GIT PAD DIRECCIÓN GENERAL-GIT ODS



## SDG 16.7.2. Percentage of users whose comment are related to political representativeness, prob > 0.6, by sex. 2013-2021

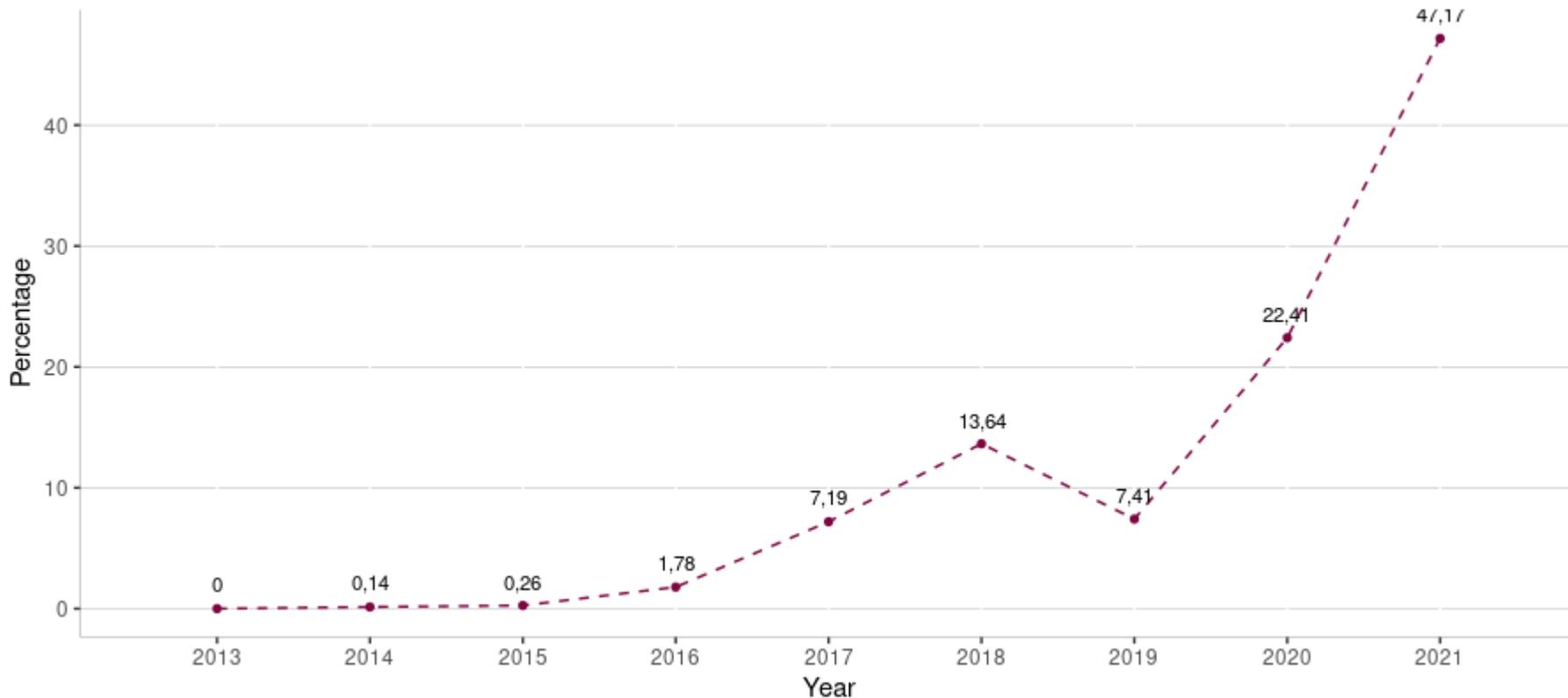


Type of political external efficacy	Sex	Absolute values	Percentage
Inclusive decision making	Women	90.172	38,78%
	Men	118.871	51,12%
Total Inclusive decision making		209.043	89,91%
Responsive decision making	Women	9.420	4,05%
	Men	14.048	6,04%
Total Responsive decision making		23.468	10,09%
Total		232.511	100,00%

Source: DIRPEN-GIT PAD DIRECCIÓN GENERAL-GIT ODS



## SDG 16.7.2. Proportion of users who consider their decision is inclusive and receptive, by year.

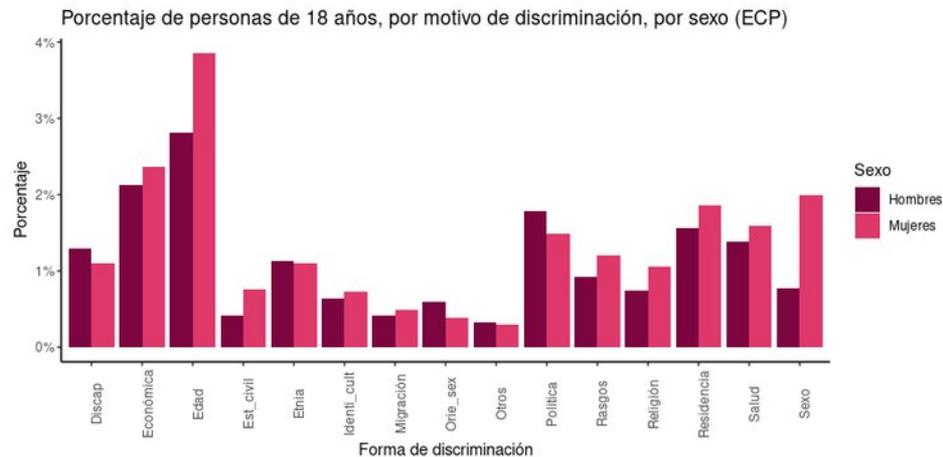
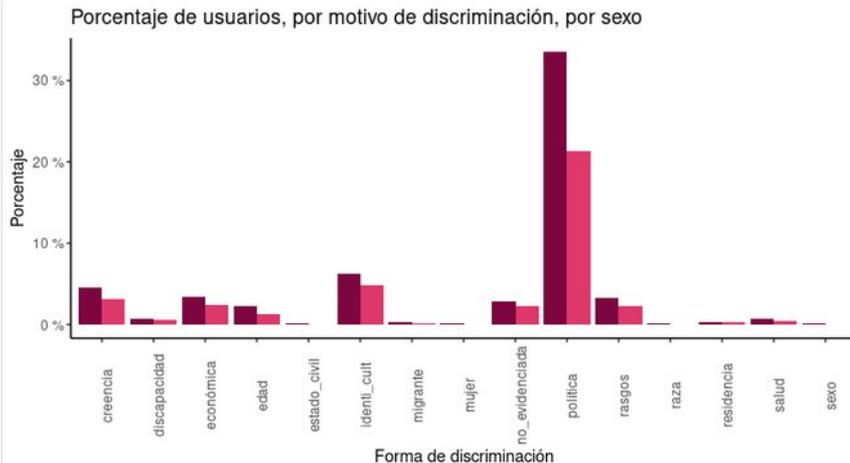


Source: DIRPEN-GIT PAD DIRECCIÓN GENERAL-GIT ODS



## SDG16.b.1. Percentage of users with comments related to discrimination (prob >0.5), by type of discrimination. Comparison with Political Culture Survey.

Non – supervised Analysis - Zero Shot Model  
2013-2021



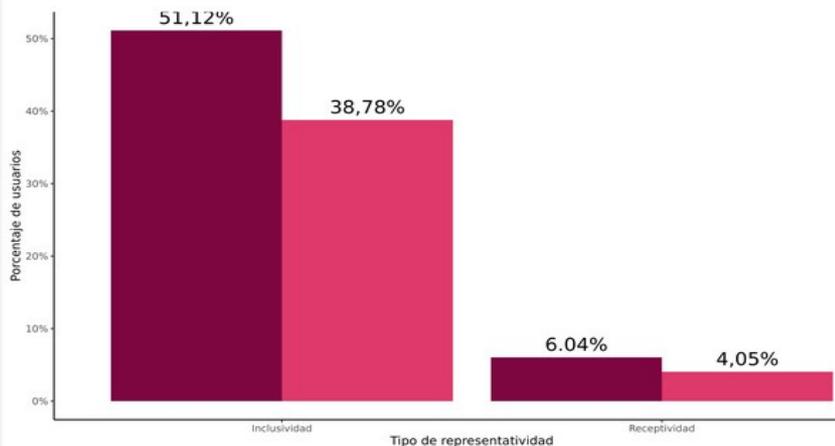
**Source:** DIRPEN-GIT PAD DIRECCIÓN GENERAL-GIT ODS

Note: Data from Political Culture Survey has subnational representativity. Every measure must be analyzed taking into account each Variance Coefficient (CV). Data are also representative for national level. Data from Facebook have representativity only from the scraped data sample.

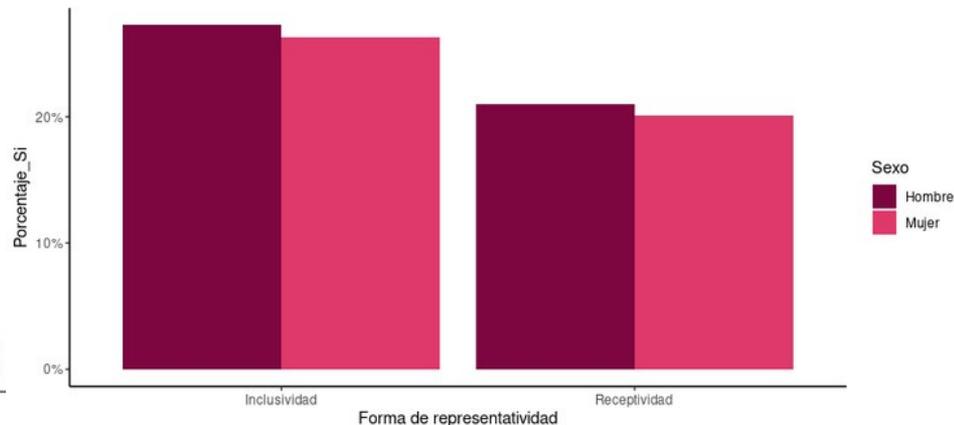


## SDG 16.7.2. Percentage of users with comments related to political representativeness (prob > 0.5), by type. Comparison with Political Culture Survey. 2013-2021

Percentage of users whose comments are related to political representativeness, by sex



Percentage of people who believe their decision is inclusive and responsive, by sex.



They differ in proportions, despite they present the same tendency (men are more likely to feel that they have something to say and that they are taken into account).

**Source:** DIRPEN-GIT PAD DIRECCIÓN GENERAL-GIT ODS

Note: Data from Political Culture Survey has subnational representativity. Every measure must be analyzed taking into account each Variance Coefficient (CV). Data are also representative for national level. Data from Facebook are only representativity from the scraped data sample.



## Comparison with official data and quality assurance

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# Quality Assurance

## Performance metrics and representativity analysis

Métrica	Tipo			
	-	Macro	Micro	Weighted
Exactitud	0.8947	-	-	-
Precisión	-	0.4798	0.8947	0.9235
Recall	-	0.4648	0.8947	0.8947
F1 Score	-	0.4722	0.8947	0.9089

### Indicator 16.7.2

Métrica	Tipo			
	-	Macro	Micro	Weighted
Exactitud	0.2047	-	-	-
Precisión	-	0.0873	0.2047	0.7822
Recall	-	0.6958	0.2047	0.2047
F1 Score	-	0.0485	0.2047	0.2625

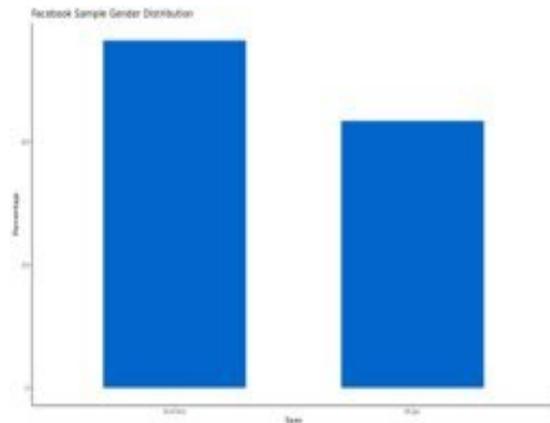
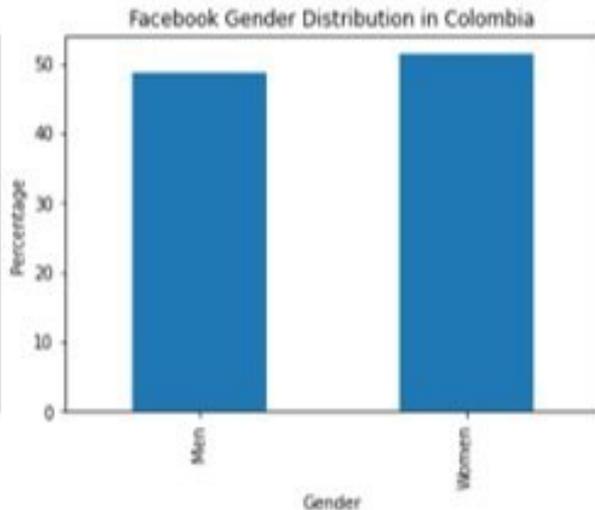
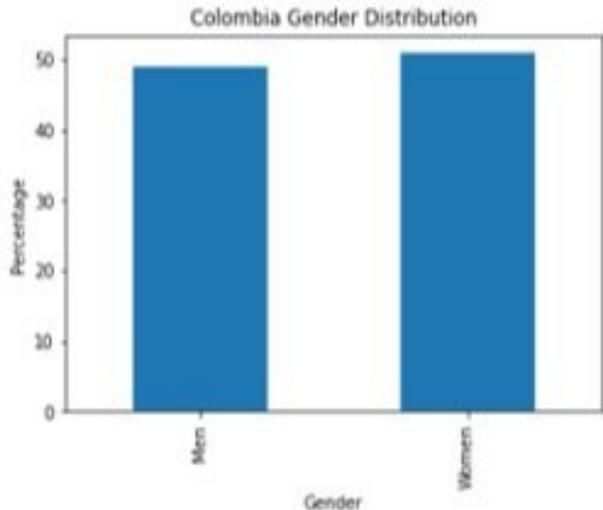
### Indicator 16.b.1

**Performance metrics show a better results from the indicator 16.7.2. Our hypothesis is the more labels the more fuzzy the transformer model results are.**



# Quality Assurance

## Performance metrics and representativity analysis



**Comparison between Sex Distribution in the country, Facebook and sample from the exercise. Opposite tendencies. Is because there was some kind of bias when data was collected?**



## Conclusions and lessons learned



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## Conclusions

- As a data source, Facebook still presents enormous challenges in data collection, processing and analysis, as well as in terms of data privacy, which is why it is not a feasible source for estimating official statistical information.
- The representativeness of the data remains a challenge. Although a strategy for this was proposed, the team designed several algorithms, this social network has many restrictions that difficult this task.
- In general terms, social media could be used as a complementary or contextual data source.



## Conclusions

- The methodology allows to generate contextual information on the prevalence of different forms of discrimination in social networks.
- It is feasible to replicate the NLP and AI models in another data source to strengthen the other works proposed in the DANE in the field of experimental statistics. Nowadays, DANE is using some of the knowledge learnt in this exercise to resolve other kind of problems (e.g., AI virtual assistance for fieldwork and for internal processes improvement).
- More feasible and well – grounded methodologies could be applied in the statistical domain such as citizen science. Some institutions in Colombia already collect data using citizen science approach with great results.

## Lessons learned

- Capacity trainings should be developed in a more needs-driven and timely manner against the timelines established in the project planning.
- Better planning of activities and associated resources would optimize the use of resources and allow for better results.
- The use of scraping parallelization is required for the acquisition of data from sources such as Facebook. To that extent, the provision of cloud services allows the integration of additional equipment which facilitates to expand the capacity of downloading, processing and modeling of data.
- An *ex ante* data collection bias mitigation strategy needs to be established.

**Thank you for your  
time!**

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