Costs avoided by the inclusion of Finerenone based on hospitalization and death due to cardiovascular events and the progression of Chronic Kidney Disease (CKD) in Type 2 Diabetes (T2D) in Colombia.

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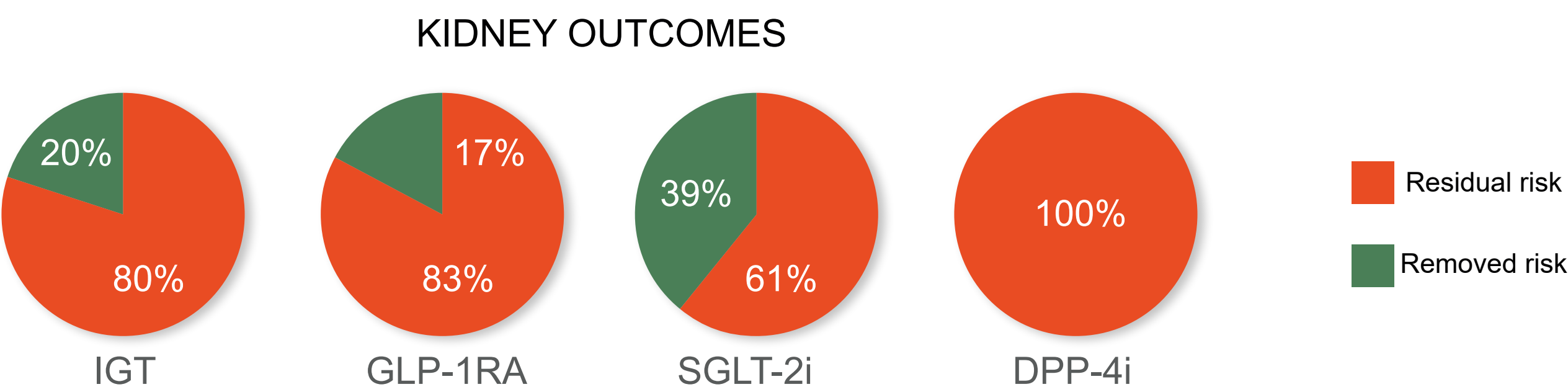
Introduction

The aldosterone escape during chronic therapy with Angiotensin-converting enzyme (ACE) inhibitors or Angiotensin II Receptor Blockers (ARBs) has been described in patients with heart failure and hypertension, as well as in patients with CKD and T2D. Despite treatment with ACE inhibitors or ARBs and the concomitant use of SGLT2 inhibitors plus hypoglycemic therapy, there remains a high residual risk of cardiorenal events (1–3).

Figure 1. Residual risk for CVD events
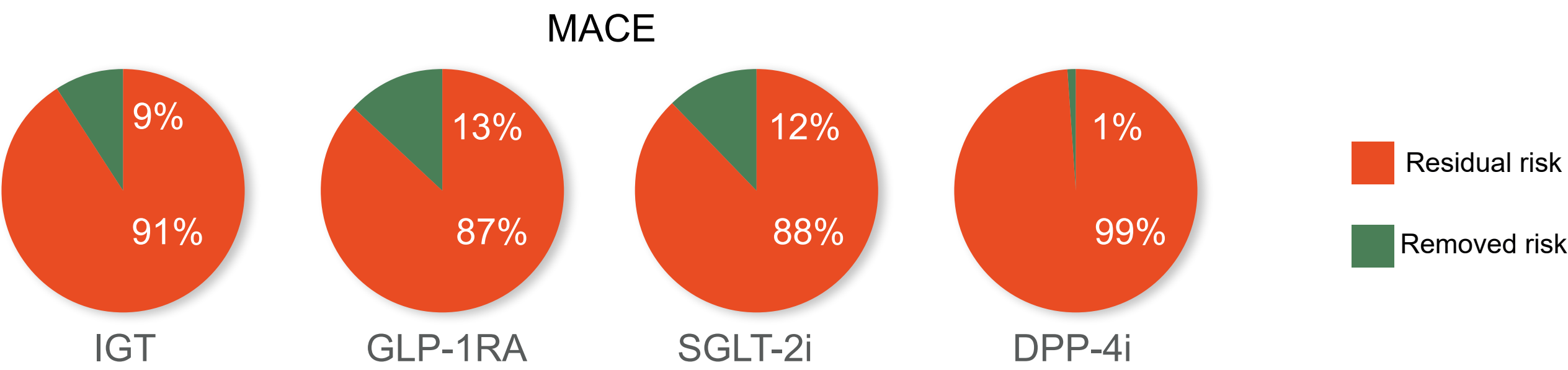
MACE

IGT 9% / 91%
GLP-1RA 13% / 87%
SGLT-2i 12% / 88%
DPP-4i 1% / 99%

Residual risk
Removed risk

IGT: Intensive Glicemic treatment. GLP-1RA: glucagon-like peptide-1 receptor agonist. SGLT-2i: sodium-glucose cotransporter 2 inhibitors. DPP-4i: dipeptidyl peptidase-4 inhibitors
Source: Consolidated based on 1-4

Figure 2. Residual risk for renal outcomes

KIDNEY OUTCOMES

IGT 20% / 80%
GLP-1RA 17% / 83%
SGLT-2i 39% / 61%
DPP-4i 100%

Residual risk
Removed risk

IGT: Intensive Glicemic treatment. GLP-1RA: glucagon-like peptide-1 receptor agonist. SGLT-2i: sodium-glucose cotransporter 2 inhibitors. DPP-4i: dipeptidyl peptidase-4 inhibitors
Source: Consolidated based on 1-3

Finerenone is a selective non-steroidal antagonist of the mineralocorticoid receptor (MR) activated by aldosterone and cortisol, which regulates gene transcription. Treatment of adults with chronic kidney disease (CKD) (with albuminuria) associated with type 2 diabetes (T2D) is indicated. According to the ICD-10, this indication is related to the codes N182 (chronic kidney disease stage 2), N184 (chronic kidney disease stage 4), N083 (glomerular disorders in diabetes mellitus), N183 (chronic kidney disease stage 3), and N181 (chronic kidney disease stage 1), as well as E132 (other specified diabetes mellitus with renal complications) and E142 (unspecified diabetes mellitus with renal complications), and E112 (type 2 diabetes mellitus with renal complications).

The results of the FIDELIO-DKD study indicate an 18% reduction in the risk of kidney failure and a 14% decrease in cardiovascular events compared to placebo plus standard therapy with ARA or ACE inhibitors (4). Similarly, the FIGARO-DKD study demonstrated a 13% reduction in the risk of cardiovascular events and a 23% decrease in sustained renal deterioration (5). The combined analysis, FIDELITY, also showed relative risk reduction for composite cardiovascular disease outcome in 14% vs standard treatment and relative risk reduction for composite renal outcome in 23% vs standard treatment (6).

Objective

To estimate the costs avoided from a social perspective by the inclusion of Finerenone including costs from hospitalization and death due to cardiovascular event and progression of CKD.
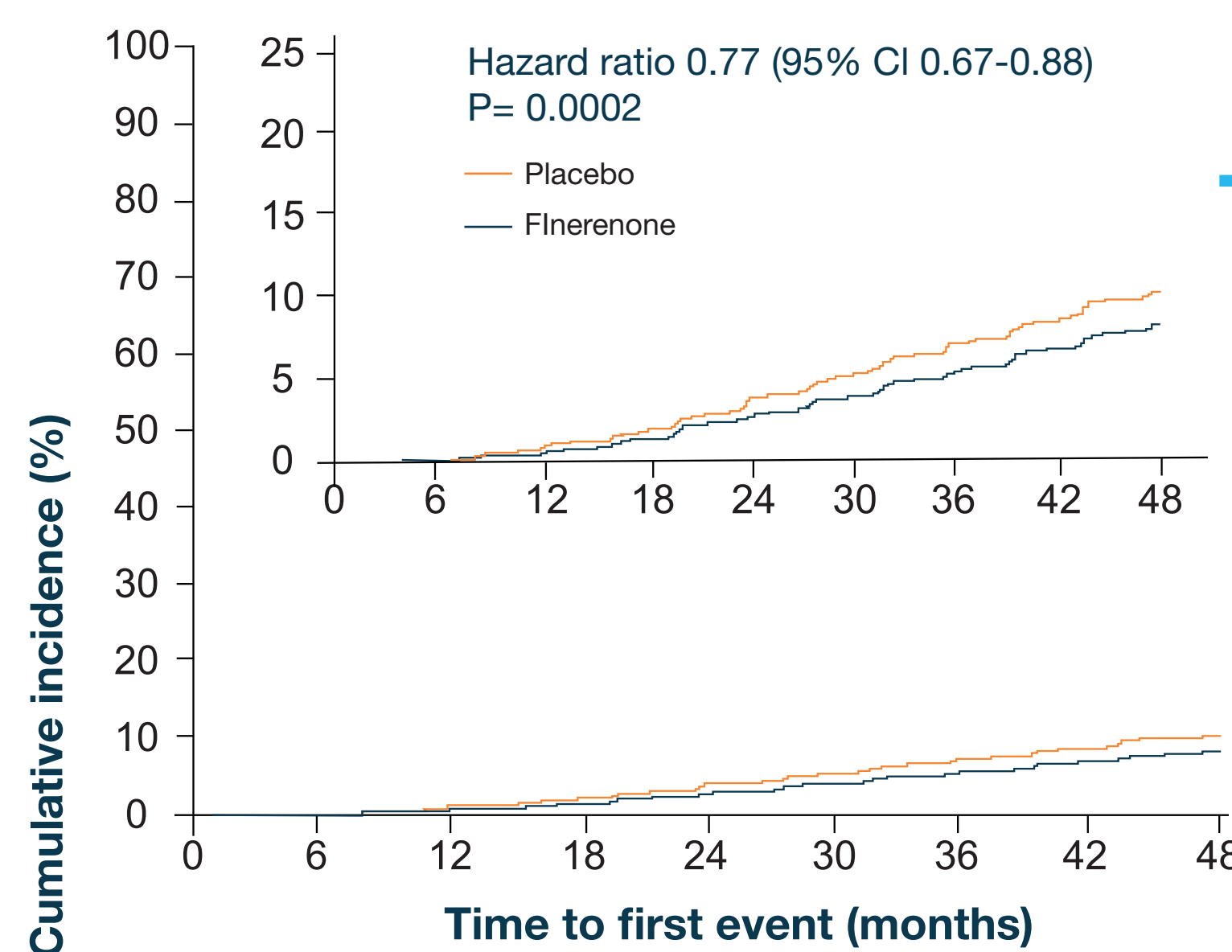
Methods & Results

Two strategies were evaluated: standard treatment (i.e., ACEi or ARBs) versus standard treatment plus Finerenone, using a Markov model associated to the stages of disease progression using the renal outcome (7).

### Figure 3. Markov probabilities adjusted with FIDELITY study results

Transition probabilities

B eGFR ≥57% composite kidney outcome

Hazard ratio 0.77 (95% CI 0.67-0.88)
P= 0.0002

Placebo
Finerenone

Cumulative incidence (%)
Time to first event (months)

No. at risk
Placebo   6407 6292 6071 5815 4949 3932 2798 1988 962
Finerenone 6519 6291 6107 5848 5027 3973 2815 2024 959

The adjusted transition matrix is estimated.
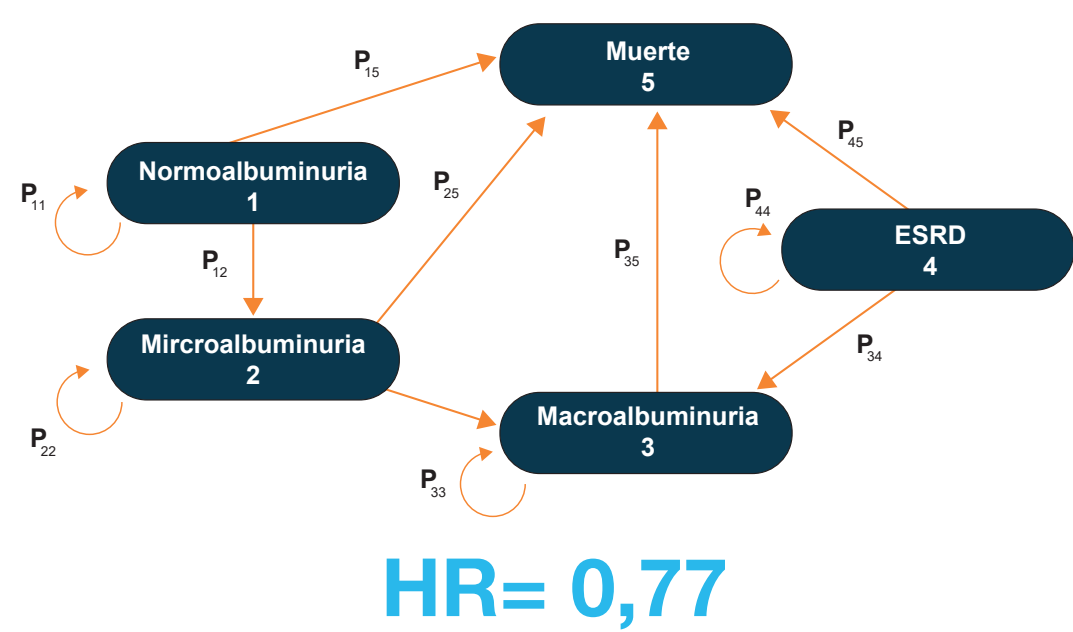
HR= 0,77

Transition probabilities

$$\begin{pmatrix} P_{1,1} & P_{1,2} & \cdots & p_{1,j} & \cdots \\ P_{2,1} & P_{2,2} & \cdots & p_{2,j} & \cdots \\ \vdots & \vdots & \ddots & \vdots & \\ P_{i,1} & P_{i,2} & \cdots & p_{1,j} & \cdots \\ \vdots & \vdots & & \vdots & \end{pmatrix}$$

Transition Probability with finerenone

$$tp(t_{ij}) = 1 - \exp\{\lambda(t-u)^\gamma - \lambda t^\gamma\}$$

The modified transition probabilities are calculated parametrically.

System of Equations

$$p_{ij} = 1 - e^{\lambda}$$
$$p^i_{ij} = 1 - e^{\lambda\gamma}$$

The value of the modified probabilities by finerenone is obtained.

Assumptions:
- Individuals remain in a finite set of defined Markov states.
- In each cycle (annual), the patient transitions from one state to another or remains in the same state based on the specified probabilities for the state and the cycle they are in (transition probabilities).
- The model continues until all individuals are in the absorbing state (states from which there is no transition) or the time horizon is reached.

Using international guidelines KDIGO 2024, the hazard ratios (HR) for acute myocardial infarction, infarction, heart failure, and hospitalization according to levels of albuminuria/creatinine ratio (ACR) and estimated glomerular filtration rate (eGFR) were taken and adjusted with the HR results of cardiovascular composite outcome of FIDELITY study (6, 8)

Figure 5. Survival and Probability of Cardiovascular Event with Finerenone

$$S(t)_{fine} = S(t)_{placebo}{}^{HR\ Finerenone\ i} \quad | \quad F(t)_{fine} = 1 - S(t)_{finerenone}$$

Non-Fatal acute myocardial infarction

Cumulative Survival Finerenone	Cumulative Probability of Heart Failure
S_{fine} = 84,99%	F_{fine} = 15,01%

Stroke

Cumulative Survival Finerenone	Cumulative Probability of Heart Failure
S_{fine} = 83,42%	F_{fine} = 16,58%

Heart Failure hospitalization

Cumulative Survival Finerenone	Cumulative Probability of Heart Failure
S_{fine} = 86,20%	F_{fine} = 13,80%

Table 1. Hospitalization probabilities for cardiovascular outcomes by stage for Placebo and Finerenone

Stage	Acute myocardial infarction		Stroke		Heart Failure hospitalization	
	Standard treatment	Finerenone	Standard treatment	Finerenone	Standard treatment	Finerenone
Microalbuminuria	33.71%	31.21%	31.93%	31.67%	24.84%	19.97%
Macroalbuminuria	44.56%	41.53%	39.01%	38.71%	42.10%	34.70%
End Stage Renal Disease (ESRD)	59.08%	Not use indicated	55.33%	Not use indicated	94.67%	Not use indicated

Source: Calculated from FIDELITY study (6)

The estimated results are presented per patient in time horizon of 37 years, using an exchange rate of COP$4.061 Colombian pesos per US dollar (USD) for the year 2024, comparing two strategies for managing CKD and T2D Currently treatment and the same treatment including Finerenone.

Table 2. Direct costs análisis of economic burden standard treatment vs standard treatment + finerenone

Costs		Standard treatment	Standard treatment + Finerenone	Var.	Var. %
Direct cost of health system	Renal outcomes procedures, hospitalizations and resources	$15.880	$12.664	-$3.216	-19.5%
	CVD Hospitalization	$11.294	$9.468	-$1.826	-5.8%
	Finerenone	$0	$5.678	-$5.678	NA
Direct cost of out-of-pocket expenses	Medical expenses	$3.413	$3.203	-$210	-5.2%
	No Medical expenses	$6.738	$5.312	-$1.426	-20.4%
Direct cost of Health system		$54.328	$54.721	$ 393	0.7%
Direct cost of Out-of-pocket expenses		$10.151	$8.598	-$1.553	-15.3%

	Standard treatment	Standard treatment + finerenone	Var ($)	Var (%)
Total Direct Costs	$64.479	$63.319	-$1.160	-1.8%

The indirect costs due to loss of productivity, which correspond to the product of DALYs and the estimated average salary for a person over 40 years old. Using an exchange rate of COP$4.061 Colombian pesos per US dollar (USD) for the year 2024

Table 3. Indirect costs análisis of Econmic burden currently treatment vs Currently treatment

Costs		Standard treatment	Standard treatment + Finerenone	Var.	Var. %
Indirect Cost (Loss Productivity estimation)	YLL - Years of Life Lost	$28.110	$25.324	-$2.789	-9.1%
	YLD - Years Lived with Disability	$12.994	$12.169	-$824	-7.1%
Total Indirect Costs		$41.103	$37.493	-$3.610	-8.5%

Figure 6. Marginal effect of Finerenone treatment alternative compared to standard treatment by cost category (%) relative to total economic burden
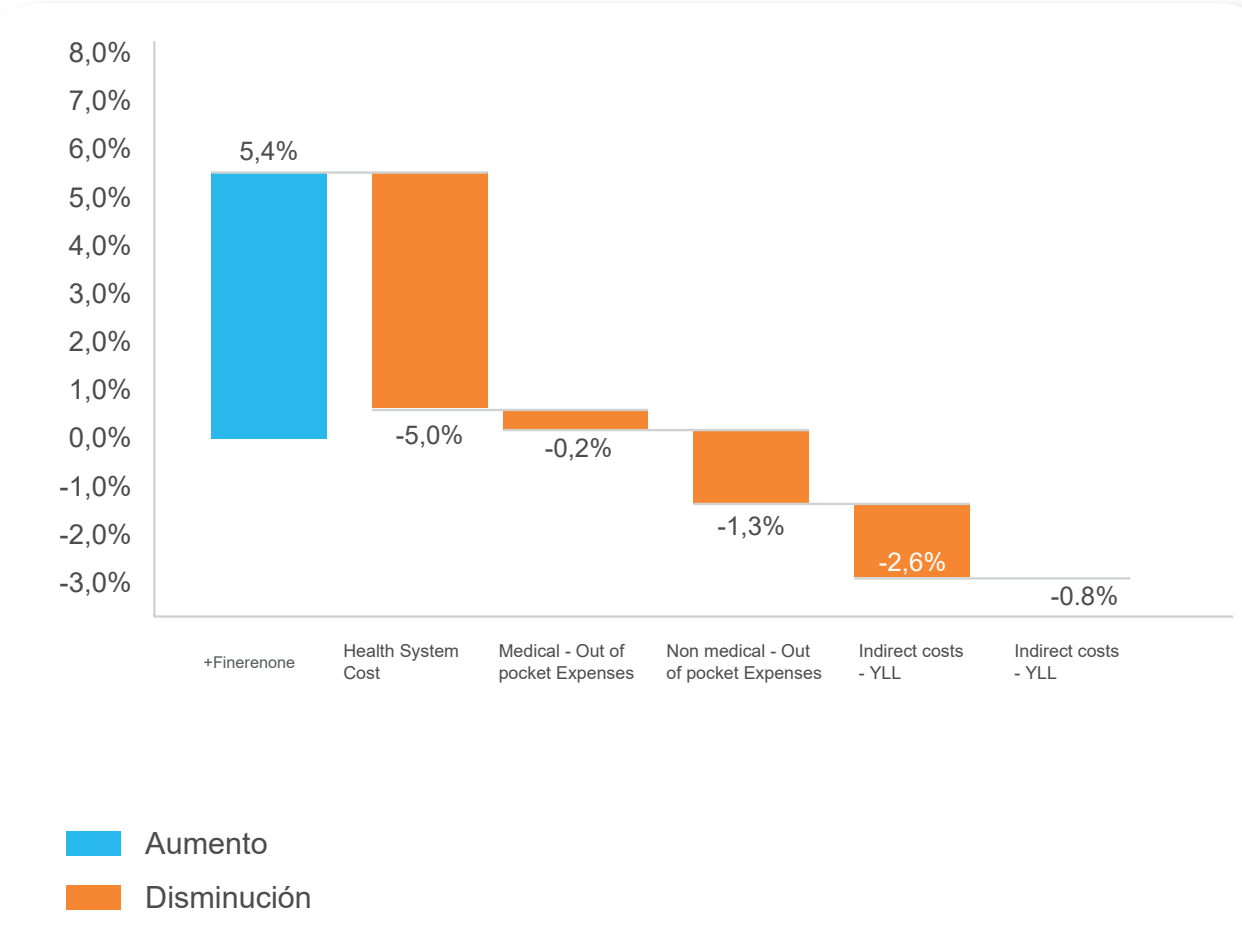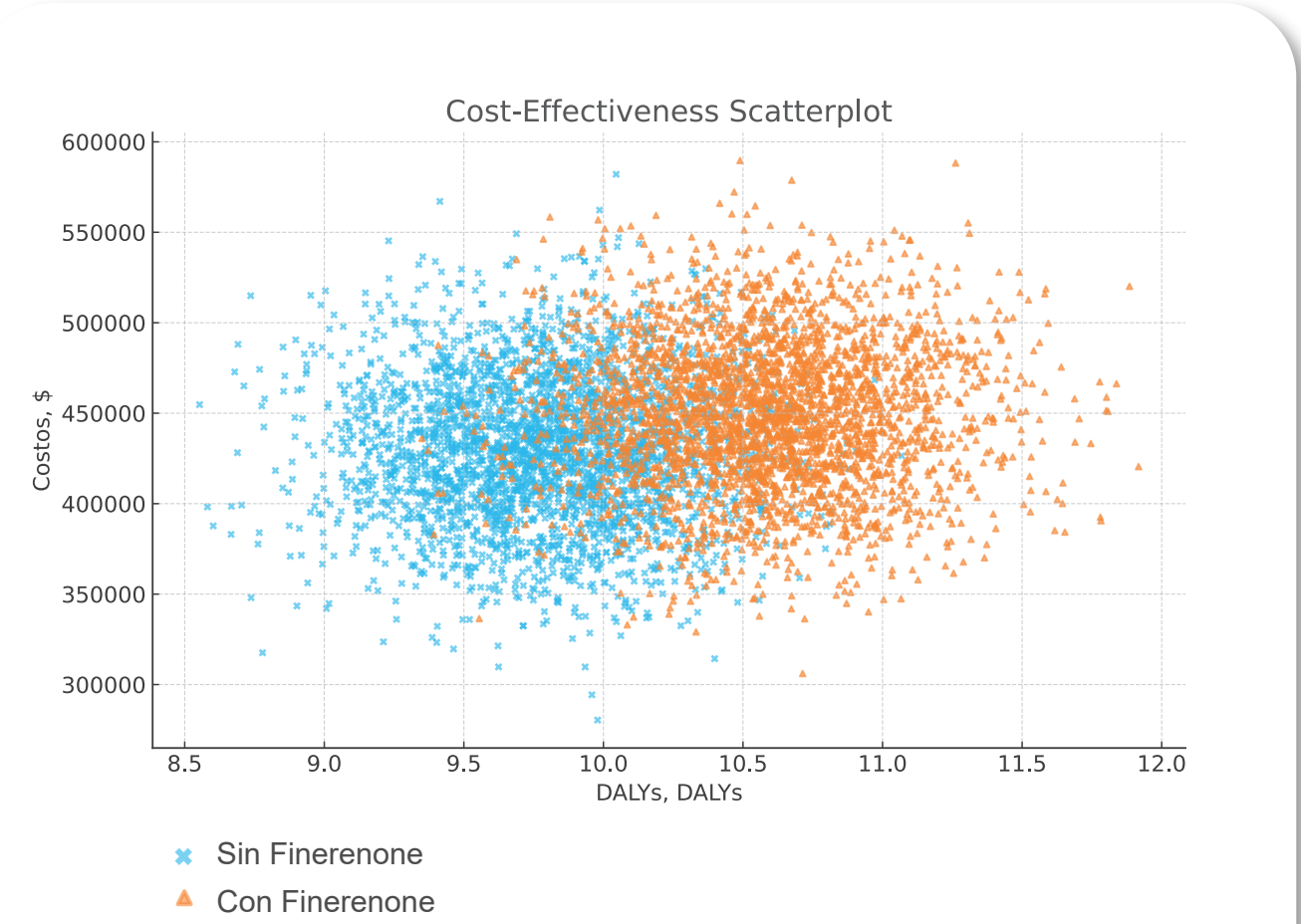

Aumento
Disminución

Figure 7. Cost and DALY Simulation for treated and untreated individuals

Cost-Effectiveness Scatterplot

Sin Finerenone
Con Finerenone

Conclusions

The inclusion of Finerenone reduces the economic burden of Diabetic Kidney Disease (DKD) by 4,5%, equivalent to USD$4.770 per patient in time horizon of 37 years.

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