



# Determinants of Adaptation and Insurance Interest in a Flood-prone urban informal settlement:

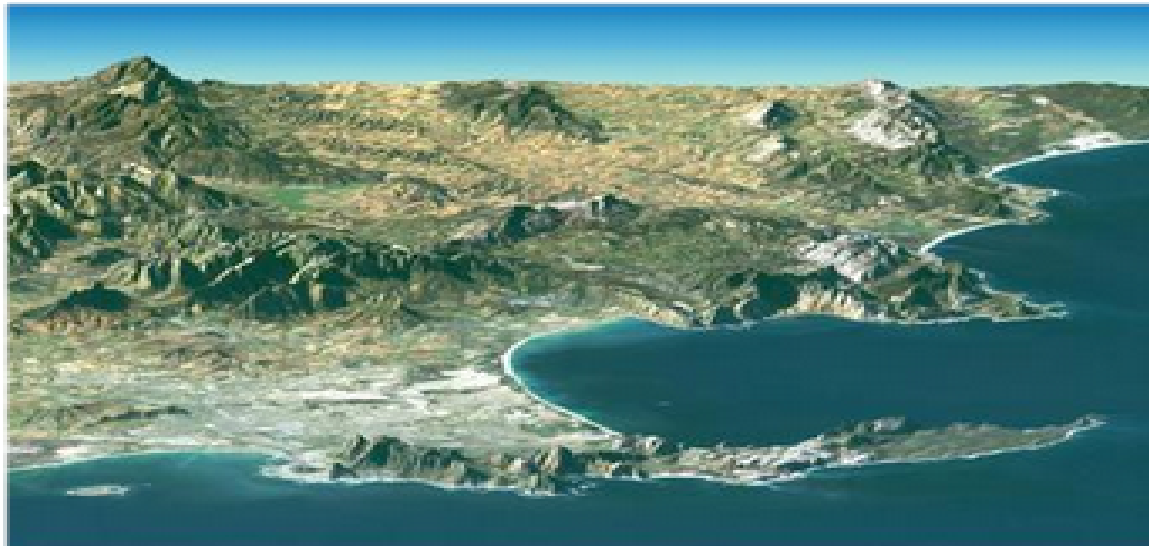
Experimental Evidence from Cape Town

Kerri Brick and Martine Visser (UCT)

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# Background

- Explore the determinants of adaptive behaviour & insurance uptake in a flood mitigation context
  - experimentally elicited risk preferences are correlated with adaptive behaviour
- Cape Town's informal settlement situated on Cape Flats
  - Low lying area with a high water table
  - Informal settlements: adjacent to rivers and canals or in retention ponds



# Background

- Communities vulnerable to flooding
  - Inadequate storm water infrastructure
  - Rubbish blockages in drainage pipes
- Entire communities affected
  - CCT (2005) survey of 3 informal settlements in the Cape Flats: 83% of residents affected
- Flooding and Storm Planning task team of the City of Cape Town has identified:
  - 20 informal settlements that are at high risk of winter flooding
  - 14 *very* high risk informal settlements that need to be relocated
- Relocation not a short term reality

# Flood mitigation strategies

- Ensure floor is elevated off the ground on pallets, stilts or sandbags
- Perform general maintenance on roof before rainy season
- Ensure roof is slanted
- Secure plastic sheeting to roof and/or floor
- Ensure trenches/channels around home are not blocked with refuse

# Recruitment





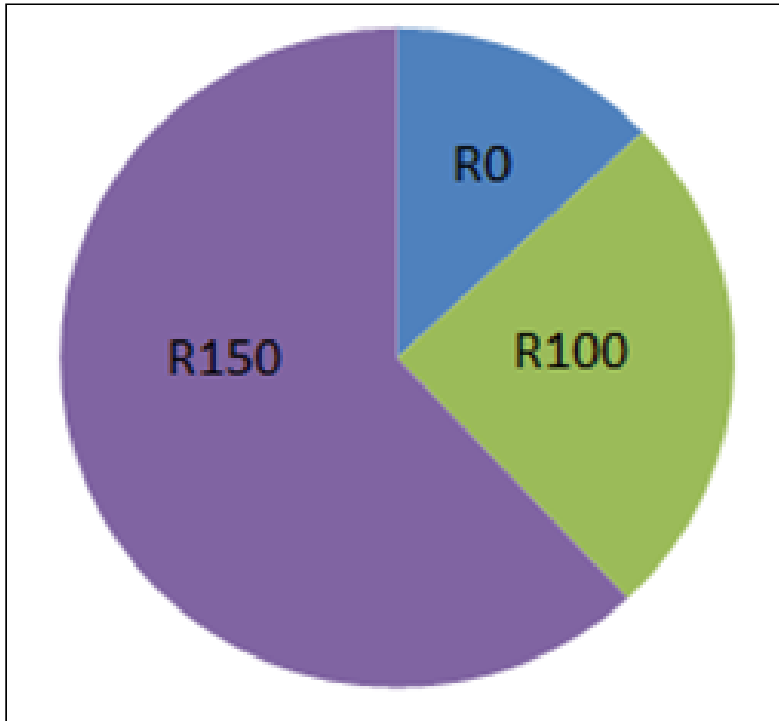
# Survey



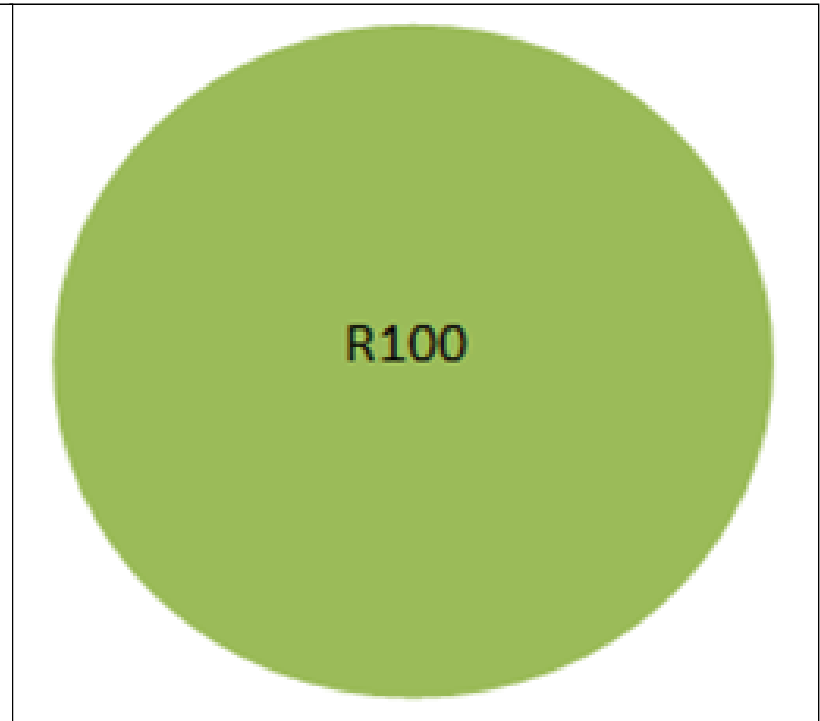
- Demographics
- Financial questions
  - Saving, credit and insurance
- Experience of flood and fire
- Flood and fire mitigation strategies
- Attitudes to risk
- Engagement in risky activities
  
- Household insurance product - Hollard

# Experiment procedures

Option 1



Option 2



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# Sample: BM section, Khayelitsha

	All	Treatment 1 (Gains)	Treatment 2 (Mixed)	Treatment 3 (Loss)
	n = 174	n = 60	n = 60	n = 54
Age				
Mean	32.42	35.42	31.87	29.66
Std. dev.	9.91	9.74	10.87	8.03
Female (%)	60.34	66.67	65.00	48.15
Education				
Mean	12.33	11.68	12.28	13.11
Std. dev.	2.48	2.44	2.40	2.45
HH size				
Mean	5.21	5.30	5.49	4.79
Std. dev.	2.32	2.11	2.27	2.57
HH income				
Mean	4.71	4.15	5.67	4.28
Std. dev.	2.73	2.72	3.03	2.07
Income bracket	R1001 – R2000	R1001 – R2000	R2001 – R3000	R1001 – R2000
Unemployed (%)	39.08	46.67	36.67	33.33

# Sample: BM section, Khayelitsha



# Sample: aftermath of floods

- Damage to home (33%) and property (48%)
- Floor is wet/underwater (24%)
- Roads around home are wet and muddy (30%)
- Difficulties reaching communal toilets (30%)
- People (especially children) become sick from pools of flood water (43%)
- Electricity outages (43%)
- Remain in dwelling to prevent theft of belongings (52%)

# Sample: flooding and flood mitigation

	All	Treatment 1 (Gains)	Treatment 2 (Mixed)	Treatment 3 (Loss)
	n = 174	n = 60	n = 60	n = 54
Annual flooding (%)	79.89	80.00	75.00	85.19
Flood risk mitigation strategies (%)				
Do nothing	10.34	16.67	6.67	7.41
Raise floor above ground	55.75	45.00	53.33	70.37
Use pallets to raise floor above ground	16.09	15.00	15.00	18.52
Use stilts to raise floor above ground	8.62	5.00	15.00	5.56
Use bags of sand to raise floor above ground	17.82	15.00	15.00	24.07
Put plastic sheeting on the roof	44.25	43.33	48.33	40.74
Put plastic sheeting on the floor	14.37	13.33	10.00	20.37
Raise one side of the roof	8.62	6.67	3.33	16.67
Perform general maintenance on the roof	21.84	18.33	25.00	22.22
Dig trenches/channels around the home	51.15	55.00	56.67	40.74
Ensure drains/trenches/channels around home are not blocked	53.45	51.67	48.33	61.11
Waiting to be moved to another area	14.37	16.67	15.00	11.11
Waiting to be given formal housing	22.99	26.67	23.33	18.52

# Individual characteristics: adaptation

- *Do Nothing:*
  - I have not done anything to reduce the risk of flooding
  - I am waiting to be moved to a different area
  - I am waiting for formal housing;
- *Least Costly:*
  - I put plastic sheeting on my roof and/or floor
  - I perform general maintenance on my roof before the start of the rainy season
  - I make sure that the drains/trenches around my dwelling are not blocked;
- *Most Costly:*
  - I use pallets, stilts or sand bags to raise my home above ground level
  - I raise one side of my roof
  - I have moved to another area where the risk of flooding is lower
  - I have dug trenches/channels around my home

		Coef.	Rob. Std. Err.	P>z	[95% Conf. Interval]	
r	Cons	0.396	0.325	0.222	-0.240	1.032
	Loss frame	-0.165	0.214	0.441	-0.583	0.254
	Mixed frame	-1.532	0.759	0.044	-3.020	-0.043
	Female	-0.526	0.203	0.010	-0.924	-0.128
	17-25 yrs.	0.423	0.472	0.370	-0.502	1.349
	26-39 yrs.	0.443	0.278	0.111	-0.102	0.988
	HH income	0.034	0.033	0.301	-0.031	0.099
	Grade 12	-0.159	0.160	0.321	-0.473	0.155
	Least costly	-0.359	0.671	0.593	-1.674	0.957
	Most costly	0.032	0.286	0.912	-0.530	0.593
	Mixed*Female	0.761	0.303	0.012	0.167	1.355
	Mixed*17-25 yrs.	0.346	0.827	0.675	-1.275	1.967
	Mixed*26-39 yrs.	0.616	0.712	0.387	-0.780	2.012
	Loss*Female	-0.473	0.467	0.310	-1.388	0.441
	Loss*17-25 yrs.	-1.612	0.858	0.060	-3.295	0.070
	Loss*26-39 yrs.	-0.752	0.428	0.078	-1.590	0.086
	Least costly*Female	0.226	0.385	0.558	-0.529	0.981
	Least costly*17-25 yrs.	-0.054	0.831	0.949	-1.683	1.576
	Least costly*26-39 yrs.	-0.322	0.786	0.682	-1.863	1.219
	<b>Most costly*female</b>	<b>0.556</b>	<b>0.233</b>	<b>0.017</b>	<b>0.098</b>	<b>1.013</b>
	Most costly*17-25 yrs.	-0.432	0.478	0.367	-1.368	0.505
	Most costly*26-39 yrs.	-0.637	0.309	0.039	-1.244	-0.031

Category	Variables	Regression 1		Regression 2		Regression 3	
		RRR	Std. Err.	RRR	Std. Err.	RRR	Std. Err.
Most costly	Cons	1.103	1.008	0.311	0.263	0.483	0.408
	Mixed	0.986	0.590	0.994	0.594	0.986	0.585
	Loss	1.080	0.689	1.123	0.693	1.118	0.687
	Female	2.230	1.029	1.928	0.850	1.909	0.840
	17-25 yrs.	0.212*	0.151	0.193*	0.148	0.194**	0.149
	26-39 yrs.	0.232*	0.150	0.265*	0.169	0.265**	0.169
	HH income	1.163	0.145	1.203	0.156	1.203	0.155
	Grade 12	3.241*	1.981	2.886	1.655	2.904	1.661
	Damaged	6.077**	3.795	6.693**	4.199	6.662**	4.130
	Badly damaged	5.816**	3.639	5.946**	3.535	5.940**	3.556
	Lottery	0.875	0.065	-	-	-	-
	Orisks	-	-	1.605	1.021	-	-
	Srisks	-	-	1.525	0.806	-	-
	NoRisk	-	-	-	-	0.650	0.317

Dependent variable: interest in insurance

	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.
Cons	0.691	0.509	0.219943*	0.150	0.458	0.303
Mixed	1.885	0.801	1.816	0.783	1.812	0.779
Loss	1.176	0.541	1.187	0.550	1.189	0.552
Female	1.769	0.680	1.481	0.537	1.477	0.539
17-25 yrs.	0.832	0.483	0.702	0.400	0.703	0.399
26-39 yrs.	1.707	0.830	1.785	0.872	1.785	0.872
HH income	1.196*	0.108	1.212	0.122	1.213	0.123
Grade 12	0.905	0.381	0.795	0.335	0.795	0.335
Damaged	0.519	0.248	0.587	0.283	0.585	0.281
Badly damaged	0.652	0.323	0.698	0.355	0.698	0.355
Lottery	0.891*	0.050				
Srisks			2.062*	0.762		
Orisks			2.133	1.122		
NoRisk					0.480*	0.171

# Discussion

- Risk preferences are correlated with adaptation strategies
- Risk preferences (lottery tasks) not correlated with demand for insurance
- No correlation between past damage from flooding and interest in insurance
  - Insurance is not a real solution in the context of mitigating risk of damage from flooding



THANK YOU!

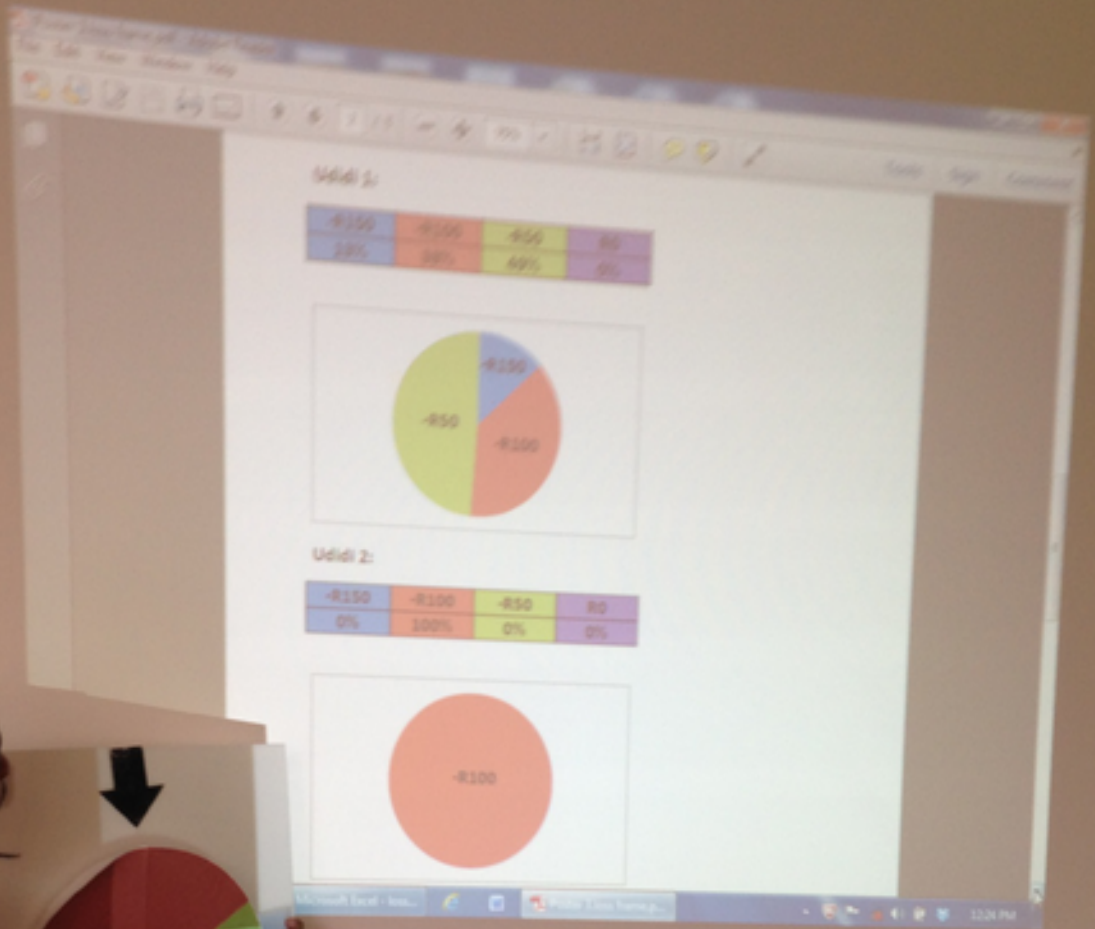


Email:

[Martine.visser@uct.ac.za](mailto:Martine.visser@uct.ac.za)

# Experiment design

	Option 1				Option 2			
Gain frame	R0	R50	R100	R150	R0	R50	R100	R150
Mixed frame	-R150	-R100	-R50	R0	-R150	-R100	-R50	R0
Loss frame	-R75	-R25	R25	R75	-R75	-R25	R25	R75
Lottery task:	Prob. 1	Prob. 2	Prob. 3	Prob 4.	Prob. 1	Prob. 2	Prob. 3	Prob. 4
1	0.13	0.00	0.25	0.62	0.00	0.00	1.00	0.00
2	0.13	0.38	0.49	0.00	0.00	1.00	0.00	0.00
3	0.00	0.00	0.62	0.38	0.13	0.00	0.13	0.74
4	0.00	0.87	0.13	0.00	0.13	0.62	0.25	0.00



		Coef.	Robust Std. Err.	P>z	[95% Conf. Interval]	
$\alpha$	Cons	0.391	0.145	0.007	0.106	0.676
	Female	0.015	0.056	0.795	-0.095	0.125
	17-25 yrs.	-0.086	0.088	0.325	-0.258	0.085
	26-39 yrs.	-0.015	0.087	0.863	-0.187	0.156
	HH income	0.008	0.016	0.639	-0.024	0.040
	Grade 12	-0.143	0.058	0.013	-0.256	-0.030
	Least costly	<b>-0.154</b>	<b>0.078</b>	<b>0.049</b>	<b>-0.308</b>	<b>-0.001</b>
	Most costly	-0.012	0.094	0.900	-0.196	0.172
$\lambda$	Cons	-0.423	0.459	0.357	-1.322	0.477
	Female	0.083	0.301	0.783	-0.507	0.673
	17-25 yrs.	1.608	0.423	0.000	0.779	2.438
	26-39 yrs.	1.586	0.392	0.000	0.817	2.355
	HH income	-0.003	0.074	0.967	-0.149	0.143
	Grade 12	-0.354	0.335	0.291	-1.011	0.303
	Least costly	0.098	0.405	0.808	-0.695	0.892
	Most costly	0.621	0.391	0.112	-0.145	1.387