Economic and Social Commission for Western Asia

Nowcasting Simulations

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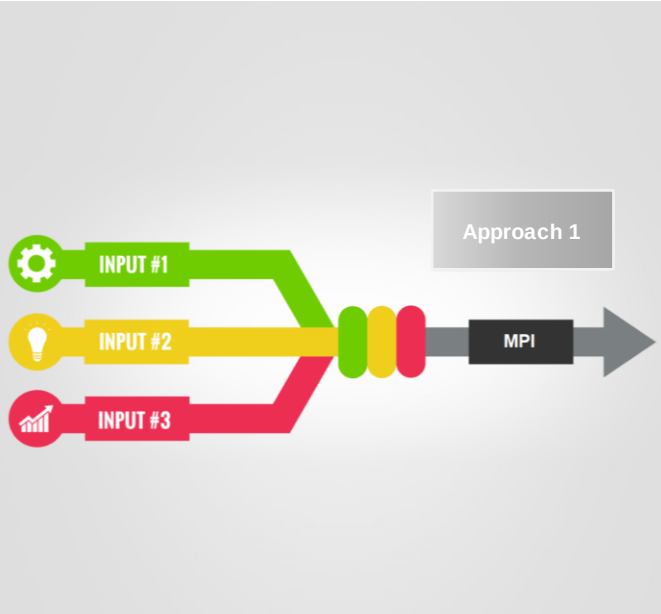
ESCWA

Shared Prosperity **Dignified Life**

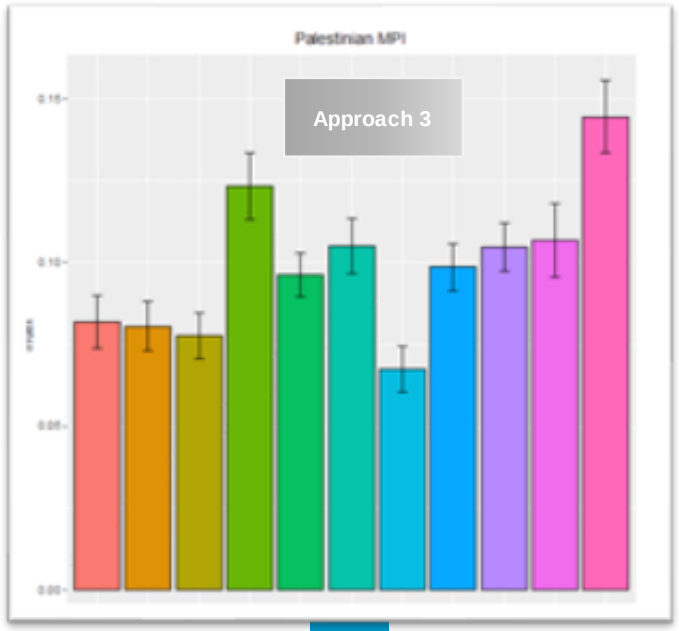
Sama El Hage Sleiman

10 February 2022

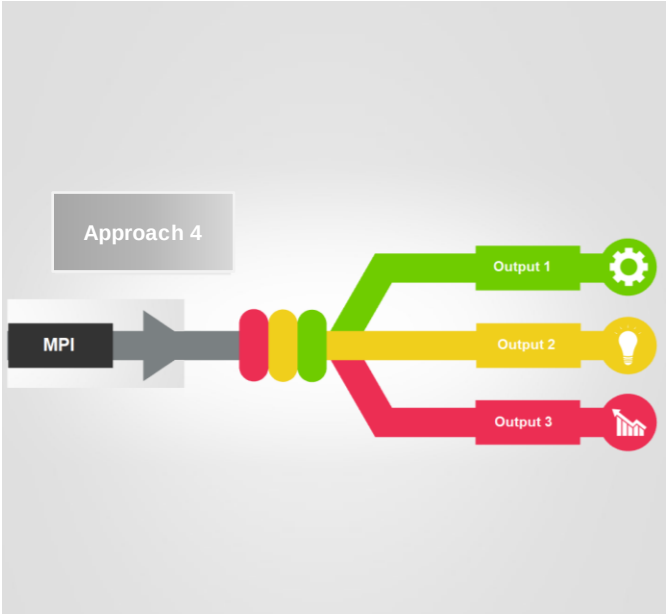
ESCWA's Three Simulations Types



- Input: shock magnitude per indicator
- Apply a positive/negative shock on microdata iteratively
- Output: Average MPI
  (The Lebanon Case)

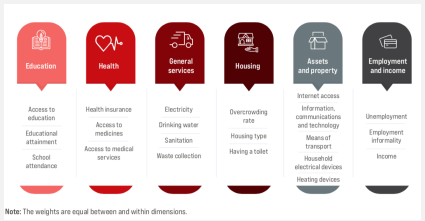


- Relate the poverty change to macro economic change
  (The case of Palestine)



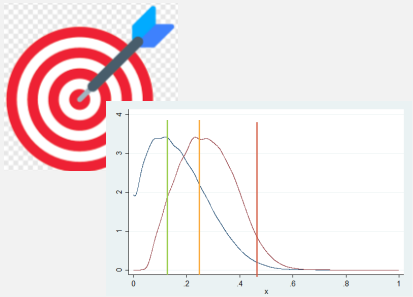
- Input:
  - the MPI reduction target
  - The total budget
  - The cost per unit of change/indicator
- Output:
  - Get 3 OPTIMAL intervention levels

The Logic

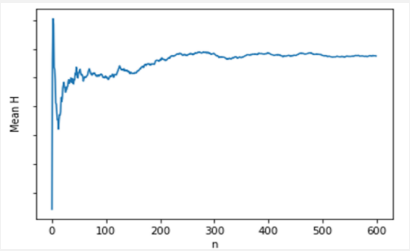


Start from an MPI FW
(binary data)

Inspect updates on indicators headcounts
1- negative or positive shock
2- magnitude



Target population eligible for change in status
1- extreme poor, poor, vulnerable, everyone? concentration of shock
2- other characteristics?

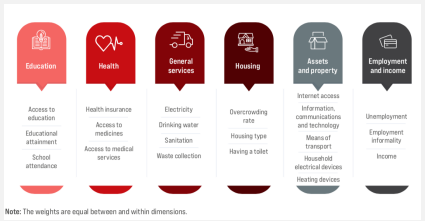


Get average poverty figures
After *n* iterations
(MonteCarlo)

Starting Assumptions

- **Shock level**: Household
- **Selection criteria**: Deprivation Score, 4 categories
- **Shock distribution**: Decide where the shock is concentrated
- **Shock direction**: Positive/Negative
- **Iterations**: to ensures randomness and convergence to the average MPI
  - **Simulation Randomness**: different selection of households
  - **Sampling Randomness:** different sampling frames

Model 1 – Uniform Shock



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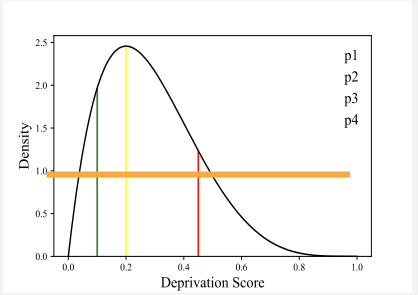
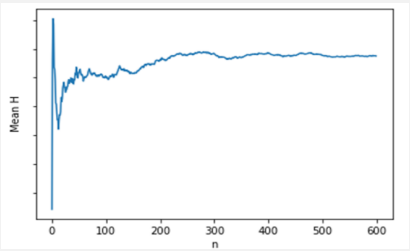
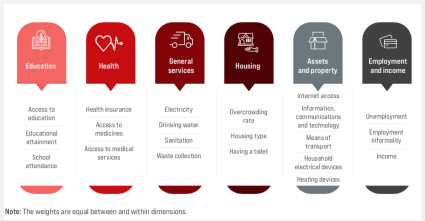


Target population Shocked uniformly
extreme poor, poor, vulnerable, everyone? concentration of shock



Get average poverty figures After *n* iterations
(MonteCarlo)

Model 2 - Generalization



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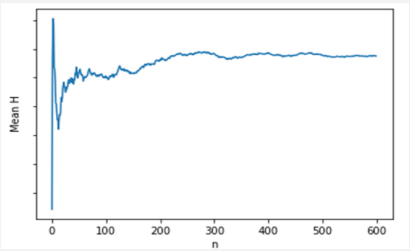


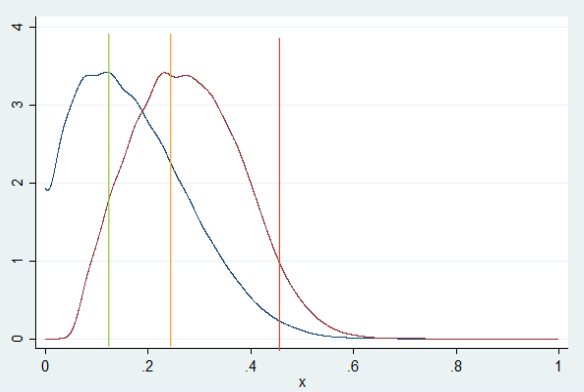
Get average poverty figures
After *n* iterations
(MonteCarlo)

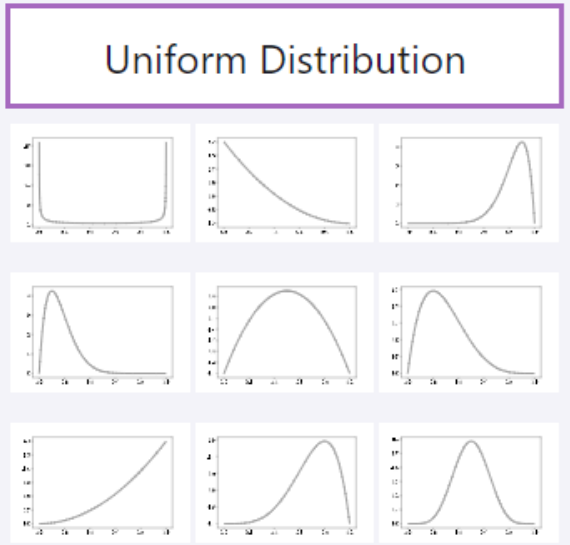
Model 2

- Let $f: (0,1) \rightarrow R$ be a probability density function. We shock a certain indicator according to the density f and with total magnitude I.

- We split the shocks into 4 bins of variable size [0,G],]G,Y],]Y,R] and]R,1]

- Perform shocks (uniform or other) on the set of concerned households with deprivation scores in each of the four bins, each with intensity a_i $, 1 \leq i \leq 4$, depending on the probability function set for the shock of that specific indicator.



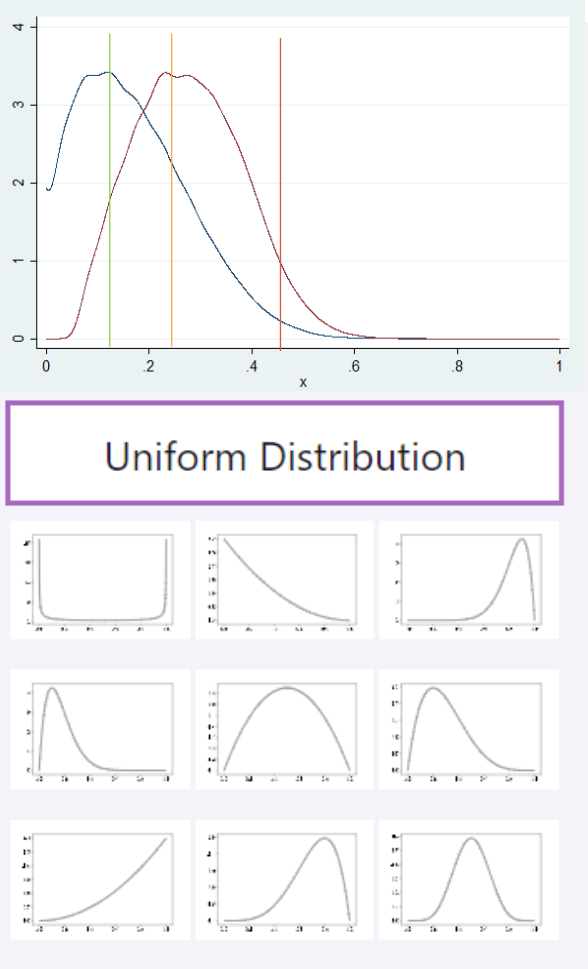


Model 2

Formulating the Shock Intensities $\mathbf{a_i}$:

First of all, we define the following variables:

- H_i : number of deprived/non-deprived households in each bin $(1 \leq i \leq 4)$. This is the number of households who are deprived for the considered indicator and whose total deprivation level lies in the interval of the bin.
- T: total number of deprived/non-deprived households for the indicator. $T = \sum_{i=1}^{4} H_i$.
- I: total magnitude of the shock (between 0 and 1).
- $p_i = \int_{bin\ i} f(x)dx$ (Generating a vector of four p_i's that together sum to 1).



Model 2

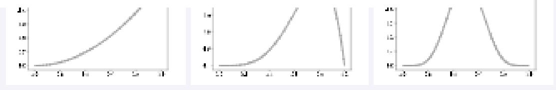
The shock intensities (general, I, and in each bin, a_i) correspond to proportions, which means they correspond to probabilities. For any chosen household, I represents its probability of being shocked. Similarly, a_i represents the probability of this households being shocked given that it belongs to bin i.

$$\mathbb{P}[shock \mid bin\ i] = a_i \quad , \quad \mathbb{P}[bin\ i] = \frac{H_i}{\sum_{k=1}^{4} H_k} = \frac{H_i}{T}$$

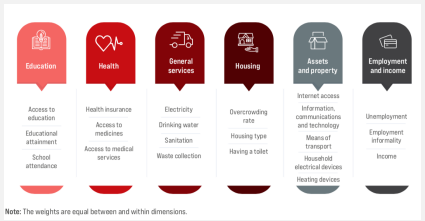
Using the law of total probability:

$$I = \mathbb{P}[shock] = \sum_{i=1}^{4} \mathbb{P}[shock \mid bin\ i] \times \mathbb{P}[bin\ i]$$

$$I = \sum_{i=1}^{4} \frac{a_i H_i}{T} \Rightarrow I \times T = \sum_{i=1}^{4} a_i H_i$$



Special Case - Application on Lebanon



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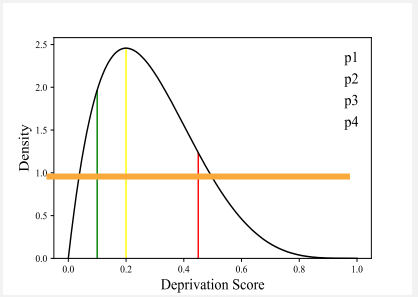
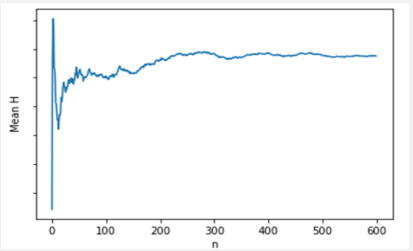


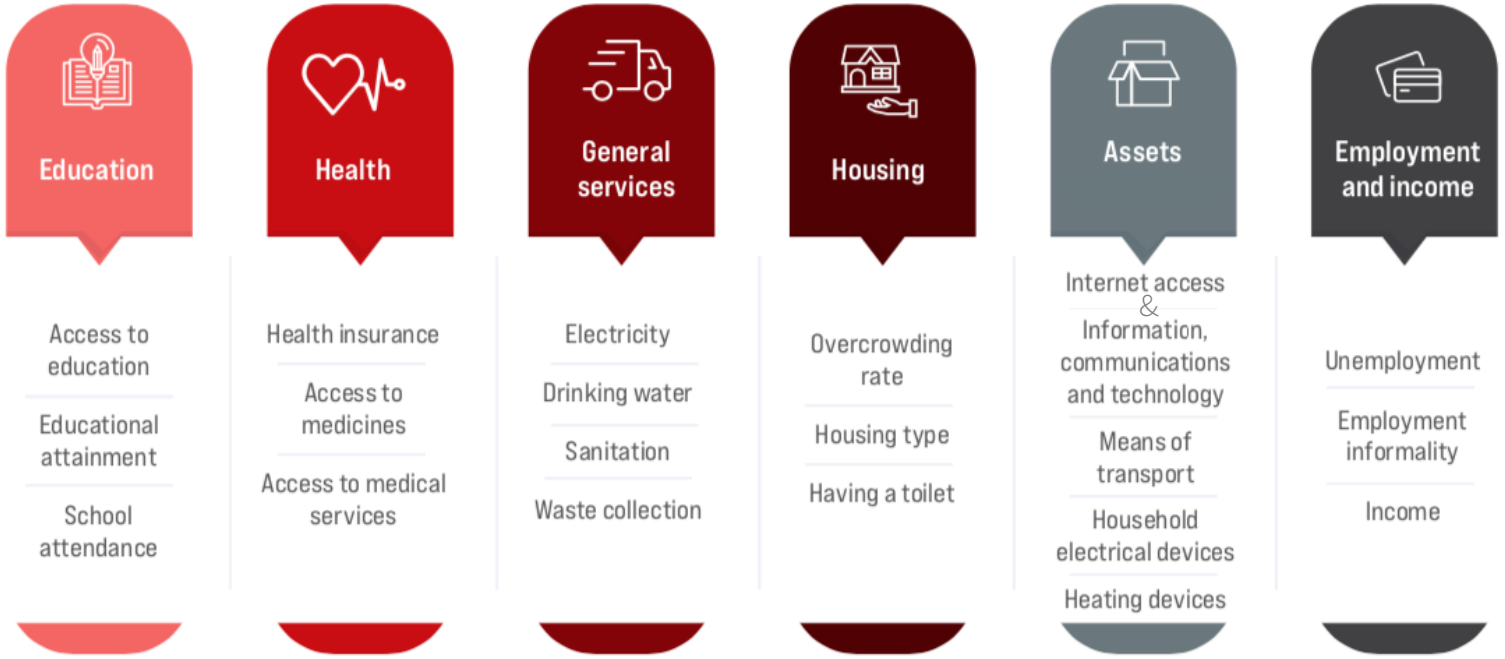
Target population **UNIFORM** Shock at INDIVIDUAL Level
Criteria: eligibility for indicators (e.g. school attendance), and other demographic criteria (nationality, area of residence,..)



Get average poverty figures After *n* iterations
(MonteCarlo)

Proposed Framework

Using the latest Labor Force and Household Living Conditions Survey (LFHLCS, 2019) for Lebanon, population-representative at the governorate level, we developed a framework (FW) to measure the Multidimensional Poverty Index (MPI) at both the national and subnational levels.



Note: The weights are equal between and within dimensions.

Impoverishment in details

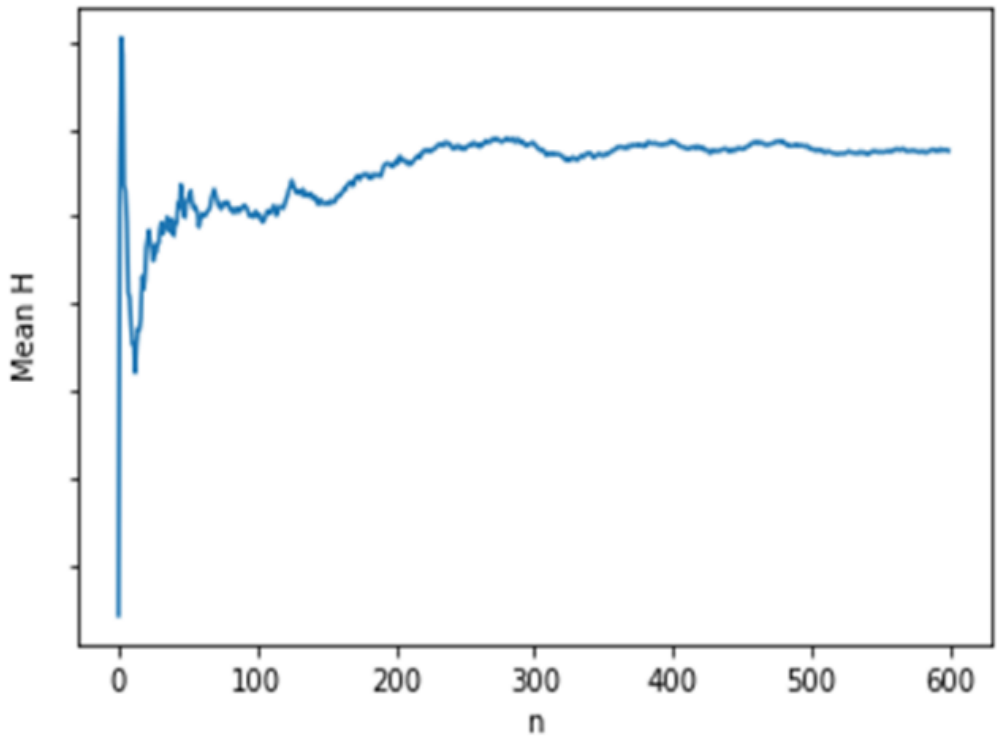
Dimension (weight)	Indicator (weight)	Shock	Deprived If
Education (weight=16.67%)	LF01 Access to Education (weight=33.33%)		HH is deprived if there is no school public, private, elementary, complementary and secondary) within a 10 minutes walk distance
	LF02 - Educational Attainment (weight=33.33%)		HH is deprived if all members aged 20+ are either: Not enrolled, Illiterate, Read and write, Pre-school, Elementary, Intermediary
	LF03 - School Attendance (weight=33.33%)	✸	HH is deprived if any member aged 5-19 is not attending school (excluding members who completed secondary)
Health (weight=16.67%)	LF04 - Health Insurance (weight=33.33%)		HH deprived if any HH member has no health insurance coverage (excluding domestic workers - no data)
	LF05 - Access to Medicines (weight=33.33%)	✸	HH deprived if any HH member needs regular medication and can't afford it (excluding domestic workers - no data)
	LF06 - Access to Medical Services (weight=33.33%)	✸	HH deprived if any HH member needs medical services and can't afford it (excluding domestic workers - no data)
General Services (weight=16.67%)	LF07 - Electricity (weight=25%)	✸	Deprived if HH has no access to electricity or a generator
	LF08 - Drinking Water (weight=25%)		Deprived if HH uses non-improved drinking water or HH uses bottled water and not improved service water
	LF09- Sanitation (weight=25%)		HH is deprived if there is no access to improved drainage technique
	LF10 - Waste Collection (weight=25%)	✸	HH is deprived if garbage is not disposed in containers or disposed of in containers inside the building which are emptied once a week or less
Housing (weight=16.67%)	LF11 - Overcrowding rate (weight=33.33%)		HH is deprived if there are more than 2 persons aged 10+ per room
	LF12 - Housing type (weight=33.33%)		Deprived if the housing situation fits at least one of the following conditions: (i) home is a place other than a stand-alone house or apartment ; (ii) area is less than 30m2 ; (iii) it has a non-permanent floor
	LF13 - Having a toilet (weight=33.33%)		HH is deprived if HH has no toilet in dwelling
Assets and Property (weight=16.67%)	LF14 - Internet Access and ICT (weight=25%)	✸	HH is deprived if it has no internet access and has neither a phone (fixed phone or cell phone), computer, iPad, TV, DVD, satellite dish
	LF15 - Means of transport (weight=25%)	✸	HH is deprived if it has neither a car nor a motorcycle and do not have access to public transportation (<10min)
	LF16 - Household electrical devices (reduced list) (weight=25%)	✸	HH is deprived if it has neither a fridge, washing machine, air conditioner nor any water heater
	LF17 - Heating devices (weight=25%)	✸	HH deprived if it has no heating other than charcoal
Employment and Income (weight=16.67%)	LF18- Unemployment (ANY) (weight=33.33%)	✸	HH deprived if all HH members, aged 20+, are unemployed or underutilized or discouraged
	LF19 Employment Informality (ALL) (weight=33.33%)		HH deprived if all HH member, aged 20+, are informally employed
	LF20 - Income (2019) (weight=33.33%)	✸	HH is deprived if adjusted income for children and economies of scale is less than 386,000 LBP

roperty

Indicator	Negative Shock Magnitude (additional increase)		Source and date of latest estimation
	Lebanese	Non Lebanese	
School Attendance (among Vulnerable HHs)	15%	35%	Unicef, June 2021
Access to Medication	47%	57%	WFP, June 2020
Access to Medical Services	27%	32%	WFP, June 2020
Internet Access and ICT	8.39%	9.155%	2021 (WFP Report June 2020 + 1SD)
Means of Transport	5.7%	6.375%	2021 (WFP Report June 2020 + 1SD)
Domestic Livelihood Assets / Household Electrical Devices	6.83%	10.08%	2021 (WFP Report June 2020 + 1SD)
Heating Assets/Devices	8.72%	11.97%	2021 (WFP Report June 2020 + 1SD)
Unemployment	1.1%		ILO, May 2020
Electricity	45%		Imagery analysis, Aug 2021
Waste Collection	33%		News reports, Aug 2021
Income	Increase the 2019 poverty line to the CPI-adjusted poverty line		CAS

Negative Shock Simulation

- Monte Carlo Simulation
- Multiple negative shocks
- Uniform shock across deprivation levels
- Number of iteration, run-time and stabilization
- HHs, or individuals, are targeted based on the characteristics of target population in the latest data source (i.e. the updated surveys).

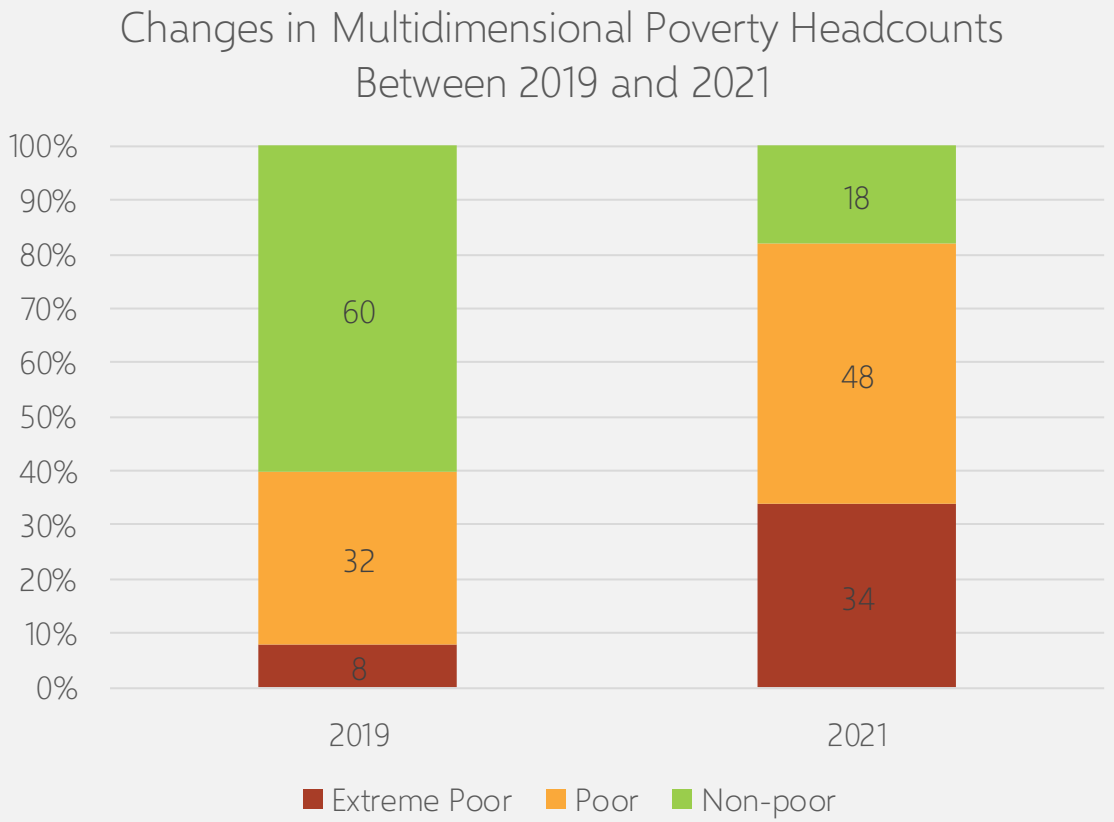


Impoverishments between 2019 to 2021

The latest survey at hand is for the year 2019, and the aim of this study is not only to compute the MPI for the base year, but also to forecast poverty measures going forward, more specifically to year 2021.

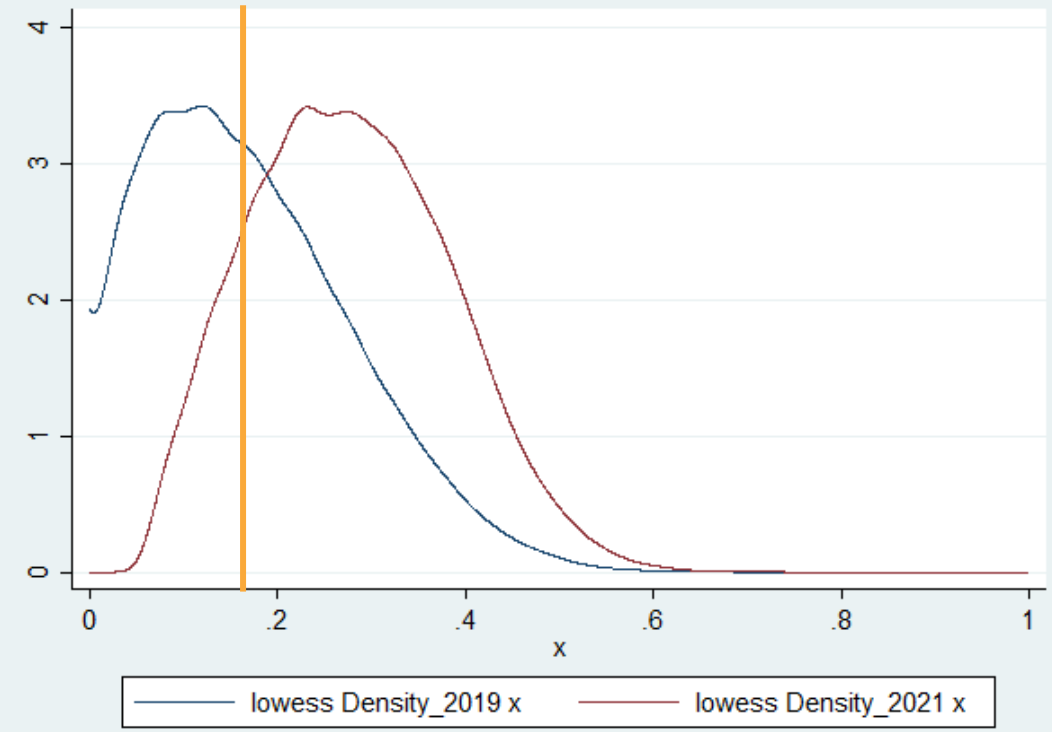
The base case is to randomly shock each indicator, by transforming the status of the non-deprived into deprived, in selected indicators.

The magnitude of the shock is based on evidence from quick assessment surveys or on other objective metrics from specialized sources.



Deprivation Scores Distributions

2019 vs 2021



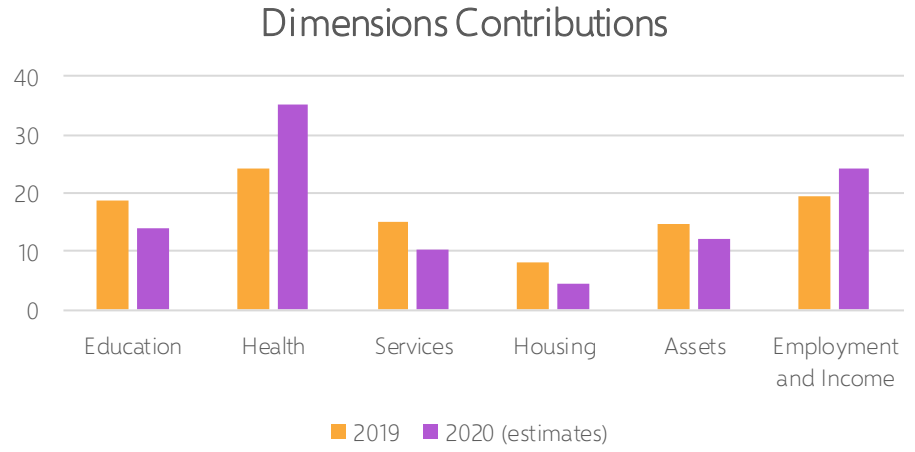
MPI	Poverty Headcount	Average Intensity
0.112	41.1%	27.3%

Lebanon 2019 : Lebanon 2019 - Final FW - reduced livelihood k=17%

Dimension (weight)	Indicator (weight)	Indicator Weight	Uncensored Headcount Ratio	Deprived if
Education (weight=16.67%)	LF01 Access to Education (weight=33.33%)	5.56%	36.8%	HH is deprived if there is no school public, private, elementary, complementary and secondary) within a 10 minutes walk distance
	LF02 - Education Attainment (weight=33.33%)	5.56%	12.2%	HH is deprived if all members aged 20+ are either: Not enrolled, Illiterate, Read and write, Pre-school, Elementary, Intermediary
	LF03 - School Attendance (weight=33.33%)	5.56%	13.2%	HH is deprived if any member aged 5-19 is not attending school (excluding members who completed secondary)
Health (weight=16.67%)	LF07 - Health Insurance (weight=33.33%)	5.56%	57.8%	HH deprived if any HH member has no health insurance coverage (excluding domestic workers - no data)
	LF08 - Access to Medication (weight=33.33%)	5.56%	10.9%	HH deprived if any HH member needs regular medication and can't afford it (excluding domestic workers - no data)
	LF09 - Access to Medical Services (weight=33.33%)	5.56%	9.4%	HH deprived if any HH member needs medical services and can't afford it (excluding domestic workers - no data)
Services (weight=16.67%)	LF11 - Electricity (weight=25%)	4.17%	17.9%	Deprived if HH has no access to electricity or a generator
	LF12 - Drinking Water (weight=25%)	4.17%	14.6%	Deprived if HH uses non-improved drinking water or HH uses bottled water and not improved service water
	LF13- Drainage (weight=25%)	4.17%	32.7%	HH is deprived if there is no access to improved drainage technique
	LF14 - Waste Collection (weight=25%)	4.17%	6.6%	HH is deprived if garbage is not disposed in containers or disposed of in containers inside the building which are emptied once a week or less
Housing (weight=16.67%)	LF15 - Type of Toilet Facility (weight=33.33%)	5.56%	0.4%	HH is deprived if HH has no toilet in dwelling
	LF16 - Overcrowding (weight=33.33%)	5.56%	15.3%	HH is deprived if there are more than 2 persons aged 10+ per room
	LF17 - Type of Dwelling (weight=33.33%)	5.56%	2.8%	Deprived if the housing situation fits at least one of the following conditions: (i) home is a place other than a stand-alone house or apartment ; (ii) area is less than 30m2 ; (iii) it has a non-permanent floor
Assets (weight=16.67%)	LF18 - Internet and ICT Assets (weight=25%)	4.17%	46.1%	HH is deprived if it has no internet access and has neither a phone (fixed phone or cell phone), computer, iPad, TV, DVD, satellite dish
	LF19 - Mobility Assets (weight=25%)	4.17%	9.1%	HH is deprived if it has neither a car nor a motorcycle and do not have access to public transportation (<10min)
	LF20 - Livelihood Assets (Reduced List) (weight=25%)	4.17%	0.7%	HH is deprived if it has neither a fridge, washing machine, air conditioner nor any water heater
	LF21 - Heating Assets (weight=25%)	4.17%	8.1%	HH deprived if it has no heating other than charcoal

2019-2020 comparative

	2019	95% confidence interval		2021	95% confidence interval	
Figure	Estimate	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound
MPI	0.106	0.105	0.107	0.255	0.238	0.273
H	0.389	0.387	0.392	0.81	0.761	0.851
A	0.272	0.272	0.273	0.32	0.307	0.328



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