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Gennaro Sosto¹ and Antonio Lucchetti²

***The results of the observational study.
Epidemiological and clinical analysis of chronic diseases
in the population of Molise region³***

The results

This chapter contains some of the results, in graphical and explanatory form, of the observational study conducted by ASReM. (Regional Health Care Authority of Molise).

The following pages highlight the potential use of some of the data processed with the 3M CRG (Clinical Risk Groups) classification system (version 2.0) as a strategic support tool to the policies of corporate reorganization as related to population health management.

The 3M CRG system allows the modulation and extraction, through data analysis, of information that proved to be useful in proposing new care pathways for specific health conditions, mainly chronic ones, and to calibrate with more efficiency and appropriateness those already in place.

Current epidemiological analysis tools, and available administrative data together with this population classification system (as selected by ASReM) contributed to the identification of clusters of recipients for interventions, supported the planning of those future actions, verified the adherence to the selected care pathways and estimated their impact.

In the following figures, the main evidence resulting from the observational study is shown; it identifies Molise as a region of features driven by epidemiological and social changes, some of which are highlighted by the study.

The total number of enrollees for the region in 2016, which fed the dataset used for classification, in encrypted form and totally anonymized, was 326.100⁴, of which 310.449 residents, 12.982 foreign residents and 3.396 foreign non-residents.

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² Physician, former Clinical Director of ASReM.

³ Part extracted from this chapter included in Gennaro Sosto. Una Popolazione a Strati. Rubbettino. 2020

⁴ Source ISTAT - Molise Residents as of 12/31/2016

Enrollee Types	No
Residents	310.449
Foreign Residents	12.982
Foreign Non-residents	3.396
Total	326.100

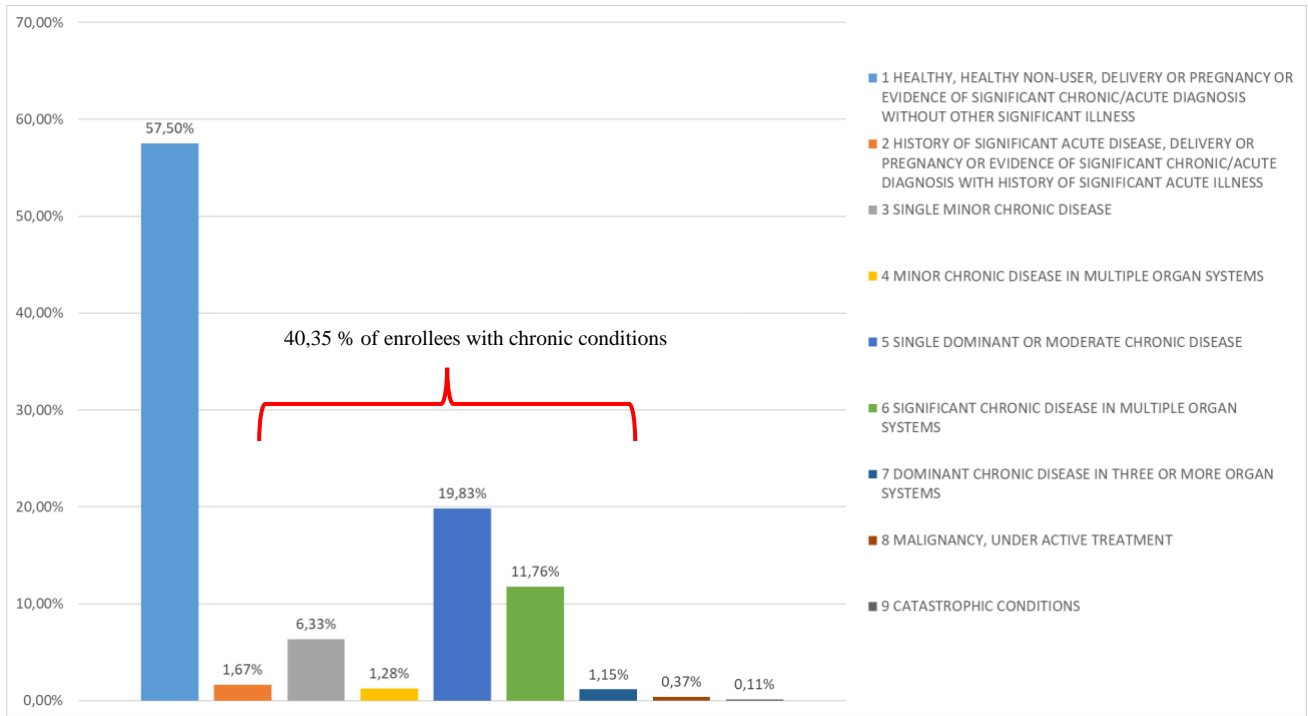
The following validation report shows the number of records loaded in the system from each coding system and the completeness of the data, as well as the validity of the diagnostic, procedure, and pharmaceutical codes.

Coding System/validation	Total No.	No. Enrollee Applicable	Avg. No. Codes by Enrollees Applicable	Valid Codes No.	Valid Codes %	Invalid Codes No.	Invalid Codes %
ATC codes	3.717.035	218.771	16,99	3.717.035	100,00	0	0,00
ICD-10 diagnosis codes	0			0		0	
ICD-9 diagnosis codes	255.788	96.336	2,66	231.788	90,62	24.000	9,38
ICD-9 procedure codes	180.180	33.564	5,37	180.101	99,96	79	0,04
ICPC codes	0			0		0	
Number of enrollees	326.100						

Moving on to the results, the most striking ones show that 40,35% of the population is included in the range of health status 3 through to 7:

Health Status	%
3 - SINGLE MINOR CHRONIC DISEASE	6,33
4 - MINOR CHRONIC DISEASE IN MULTIPLE ORGAN SYSTEMS	1,28
5 - SINGLE DOMINANT OR MODERATE CHRONIC DISEASE	19,83
6- SIGNIFICANT CHRONIC DISEASE IN MULTIPLE ORGAN SYSTEMS	11,76
7 - DOMINANT CHRONIC DISEASE IN THREE OR MORE ORGAN SYSTEMS	1,15
Total Health Status 3-7: Chronicity	40,35

The following graph shows the distribution of the population by health status (1-9).



Health status 1 is remarkable as it represents 57,50% of the population that are without acute or significant diagnosis and can be further split into three severity levels 0, 1 and 2. The percentage rate of the health status 1 individuals also includes the share of the population that in the reference year did not access any of health care providers within the region or were present in the dataset without a significant diagnosis or with only an uncertain one.

	<i>Description</i>	<i>Molise</i>
Level 0	ENROLLEE WITHOUT DIAGNOSIS (HEALTHY NON-USER OR NOT INCLUDED IN THE DATA AVAILABLE)	28,65%
Level 1	HEALTHY WITHOUT A SIGNIFICANT ACUTE OR CHRONIC DIAGNOSIS	23,10%
Level 2	DELIVERY WITHOUT OTHER SIGNIFICANT ILLNESS, PREGNANCY WITHOUT DELIVERY WITHOUT OTHER SIGNIFICANT ILLNESS, UNCERTAIN OR NOT RECENT EVIDENCE OF SIGNIFICANT CHRONIC OR ACUTE DIAGNOSIS WITHOUT OTHER SIGNIFICANT ILLNESS	5,75%

The following table shows data across all the health status (1-9) unpacked in turn according to their respective level of severity.

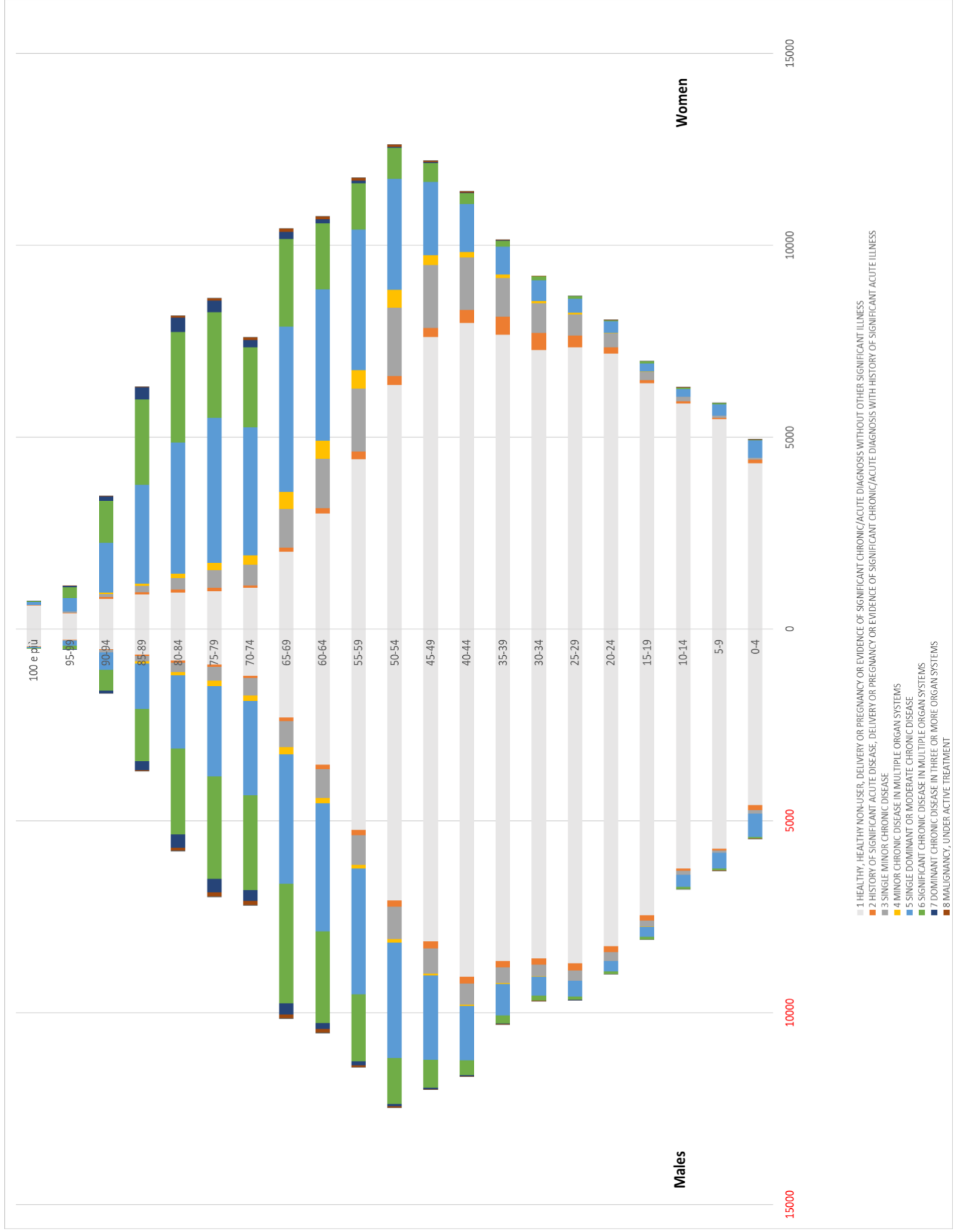
		Severity of Illness									
<i>Health Status</i>	<i>Description</i>	<i>No</i>	<i>%</i>	<i>Level 0</i>	<i>Level 1</i>	<i>Level 2</i>	<i>Level 3</i>	<i>Level 4</i>	<i>Level 5</i>	<i>Level 6</i>	
1	HEALTHY, HEALTHY NON-USER, DELIVERY OR PREGNANCY OR EVIDENCE OF SIGNIFICANT CHRONIC/ACUTE DIAGNOSIS WITHOUT OTHER SIGNIFICANT ILLNESS	187.518	57,50%	28,65%	23,10%	5,75%					
2	PREGNANCY OR EVIDENCE OF SIGNIFICANT CHRONIC/ACUTE DIAGNOSIS WITH HISTORY OF SIGNIFICANT ACUTE ILLNESS	5.450	1,67%	1,67%							
3	SINGLE MINOR CHRONIC DISEASE	20.632	6,33%		6,20%	0,13%					
4	MINOR CHRONIC DISEASE IN MULTIPLE ORGAN SYSTEMS	4.187	1,28%		1,04%	0,10%	0,14%	0,01%			
5	SINGLE DOMINANT OR MODERATE CHRONIC DISEASE	64.667	19,83%		16,53%	2,33%	0,72%	0,12%	0,12%	0,01%	
6	SIGNIFICANT CHRONIC DISEASE IN MULTIPLE ORGAN SYSTEMS	38.343	11,76%		8,01%	1,93%	0,93%	0,52%	0,28%	0,08%	
7	DOMINANT CHRONIC DISEASE IN THREE OR MORE ORGAN SYSTEMS	3.749	1,15%		0,65%	0,36%	0,07%	0,03%	0,02%	0,01%	
8	MALIGNANCY, UNDER ACTIVE TREATMENT	1.196	0,37%		0,03%	0,05%	0,16%	0,10%	0,02%	0,00%	
9	CATASTROPHIC CONDITIONS	358	0,11%		0,02%	0,01%	0,01%	0,02%	0,02%	0,02%	
<i>Total</i>		<i>326.100</i>	<i>100,00%</i>								

Higher levels of severity denote more complex the individuals in terms of health care and resource utilization. The study found that the population is predominantly distributed across severity levels 1 to 3 even for high-prevalence diseases. Therefore, healthcare systems should proactively adopt models of engagement that avoid the possible deterioration towards escalating levels of severity.

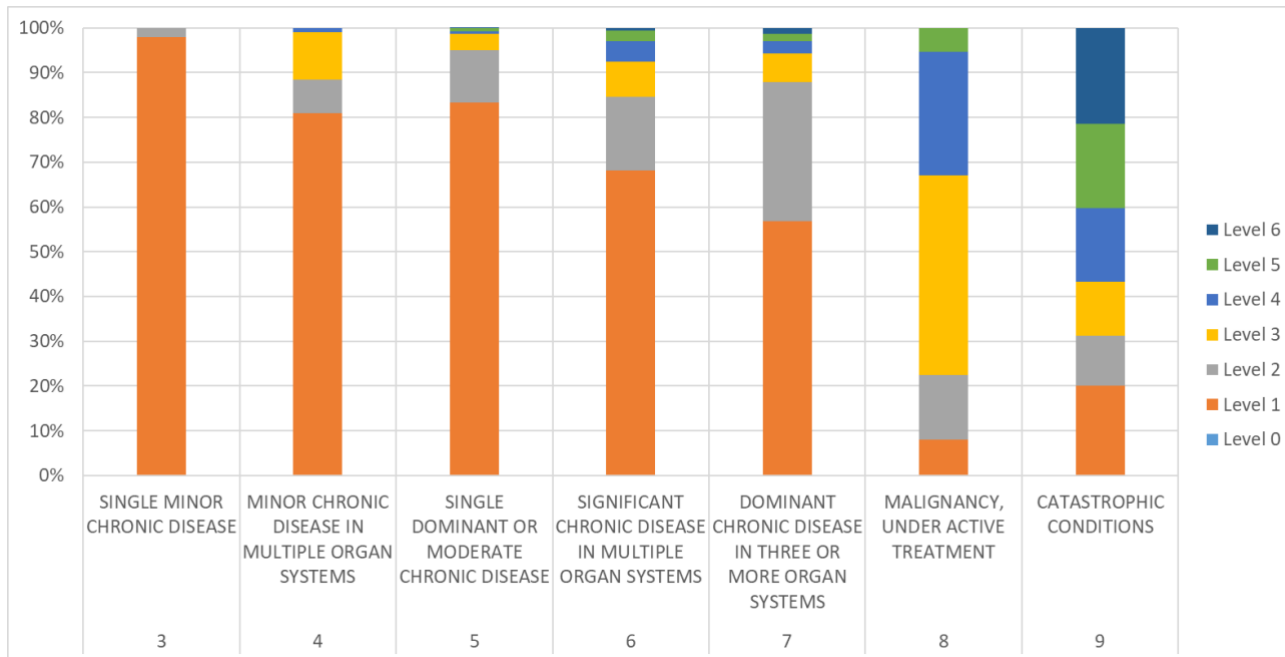
The following table shows the distribution of enrollees, in absolute values and percentages, for each health status by level of severity:

Health Status	Description	Severity of Illness												Total				
		Level 0		Level 1		Level 2		Level 3		Level 4		Level 5			Level 6			
		No	%	No	%	No	%	No	%	No	%	No	%		No	%		
1	HEALTHY, HEALTHY NON-USER, DELIVERY OR PREGNANCY OR EVIDENCE OF SIGNIFICANT CHRONIC/ACUTE DIAGNOSIS WITHOUT OTHER SIGNIFICANT ILLNESS	93.424	49,82%	75.329	40,17%	18.765	10,01%										100,00%	
2	HISTORY OF SIGNIFICANT ACUTE DISEASE, DELIVERY OR PREGNANCY OR EVIDENCE OF SIGNIFICANT CHRONIC/ACUTE DIAGNOSIS WITH HISTORY OF SIGNIFICANT ACUTE ILLNESS	5.450	100,00%															100,00%
3	SINGLE MINOR CHRONIC DISEASE	20.202	97,92%	430	2,08%												100,00%	
4	MINOR CHRONIC DISEASE IN MULTIPLE ORGAN SYSTEMS	3.393	81,04%	310	7,40%	443	10,58%	41	0,98%								100,00%	
5	SINGLE DOMINANT OR MODERATE CHRONIC DISEASE	53.895	83,34%	7.583	11,73%	2.357	3,64%	391	0,60%	401	0,62%	40	0,06%				100,00%	
6	SIGNIFICANT CHRONIC DISEASE IN MULTIPLE ORGAN SYSTEMS	26.127	68,14%	6.306	16,45%	3.049	7,95%	1.694	4,42%	909	2,37%	258	0,67%				100,00%	
7	DOMINANT CHRONIC DISEASE IN THREE OR MORE ORGAN SYSTEMS	2.132	56,87%	1.166	31,10%	234	6,24%	108	2,88%	62	1,65%	47	1,25%				100,00%	
8	MALIGNANCY, UNDER ACTIVE TREATMENT	96	8,03%	173	14,46%	533	44,57%	330	27,59%	64	5,35%						100,00%	
9	CATASTROPHIC CONDITIONS	72	20,11%	40	11,17%	43	12,01%	59	16,48%	67	18,72%	77	21,51%				100,00%	
Total		98.874		181.246		34.773		6.659		2.623		1.503		422				

Adding the health status of each group to the commonly used age-gender pyramid of demographical statistics rendered invaluable insights into the burden of disease within the studied population.



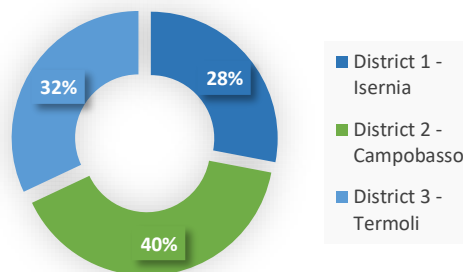
It is also appropriate to pay attention to the distribution of the population by the health status for chronic conditions (health status 3 through to 9), and the relative proportions of severity levels within those health status, since this is a most relevant measure in terms of care need.



The study allowed data to be broken down at multiple levels, in order to extrapolate sets of indicators useful for assessing the regional system in further granularity, e.g. by district or other regional entities such as Community Hospitals or Health Homes down to the individual level, and to create benchmarks among General Practitioners. The purpose of the study was to give an insight into the potential of the system, in order to understand the incidence and prevalence of chronic diseases in Molise, which, as has already been described, are 40,35% of the population, when combining the presented results at regional and district level.

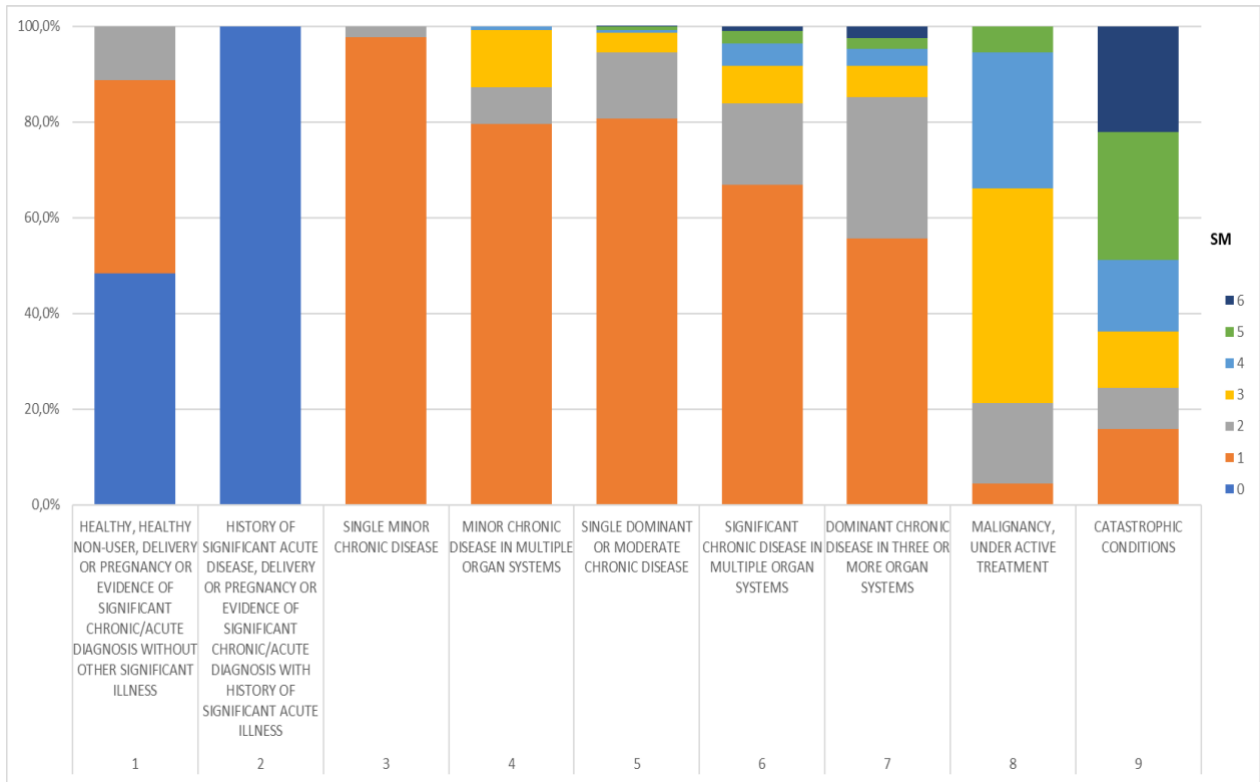
In order to provide a correct understanding, useful for the interpretation of the data that follows, it is necessary to specify the characteristics and features of the three socio-health Districts of ASReM, renumbered here according to the identification code of the previous regional districts (the original 7 health districts were consolidated into 3 by DCA 39/2018 Act of 2018):

Old District		New District	
Code	Description	Code	Description
01	Agnone	01	Isernia Residents: 86.828 Municipalities: 52 28% of the population
02	Venafro		
03	Isernia		
04	Campobasso	02	Campobasso Residents: 124.724 Municipalities: 51 40% of the population
05	Bojano		
06	Termoli	03	Termoli Residents: 101.796 Municipalities: 33 32% of the population
07	Larino		

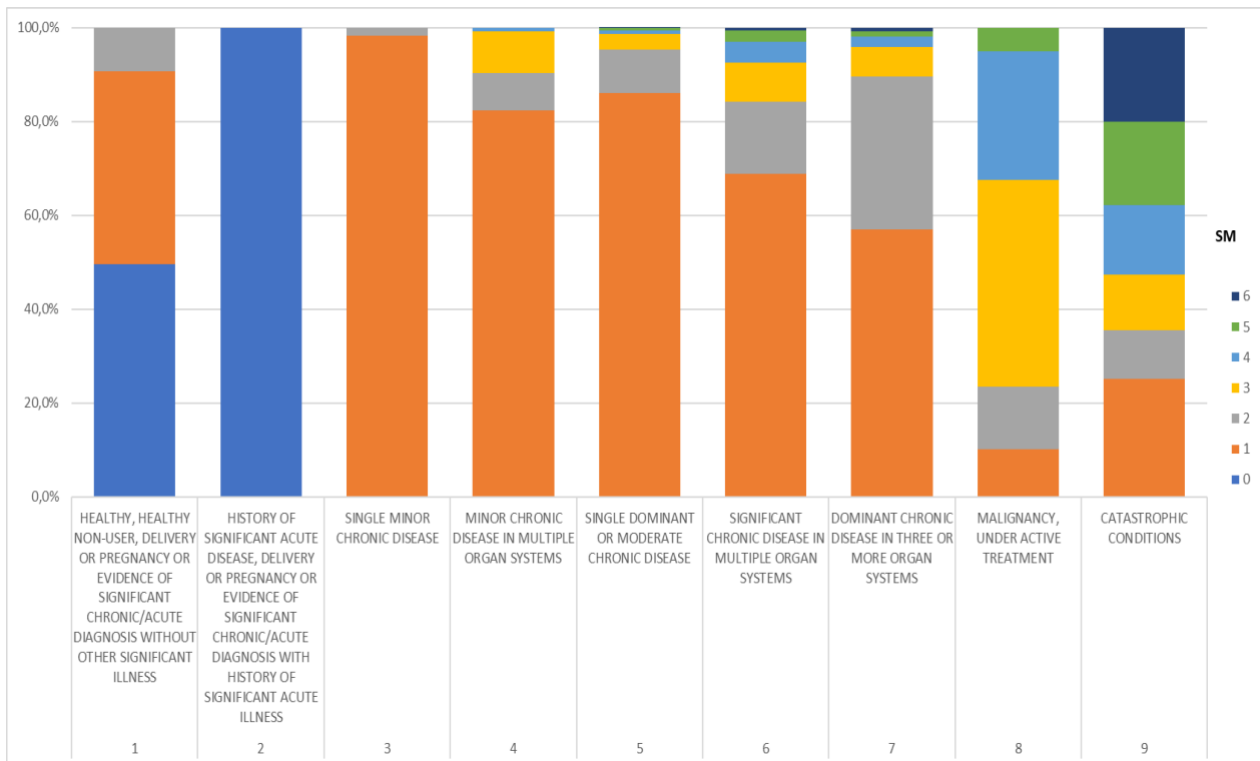


The percentage distributions of enrollees among the 9 health status by district, stratified by level of severity.

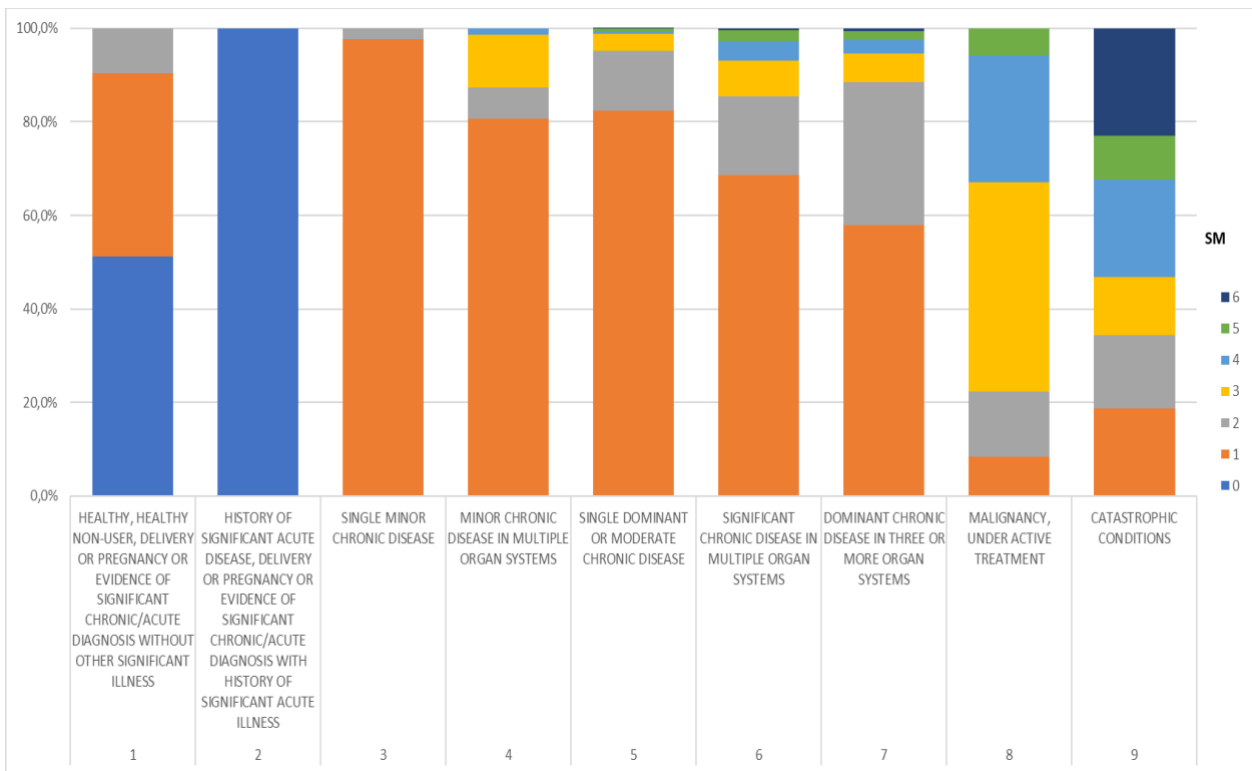
District 1 ISERNIA



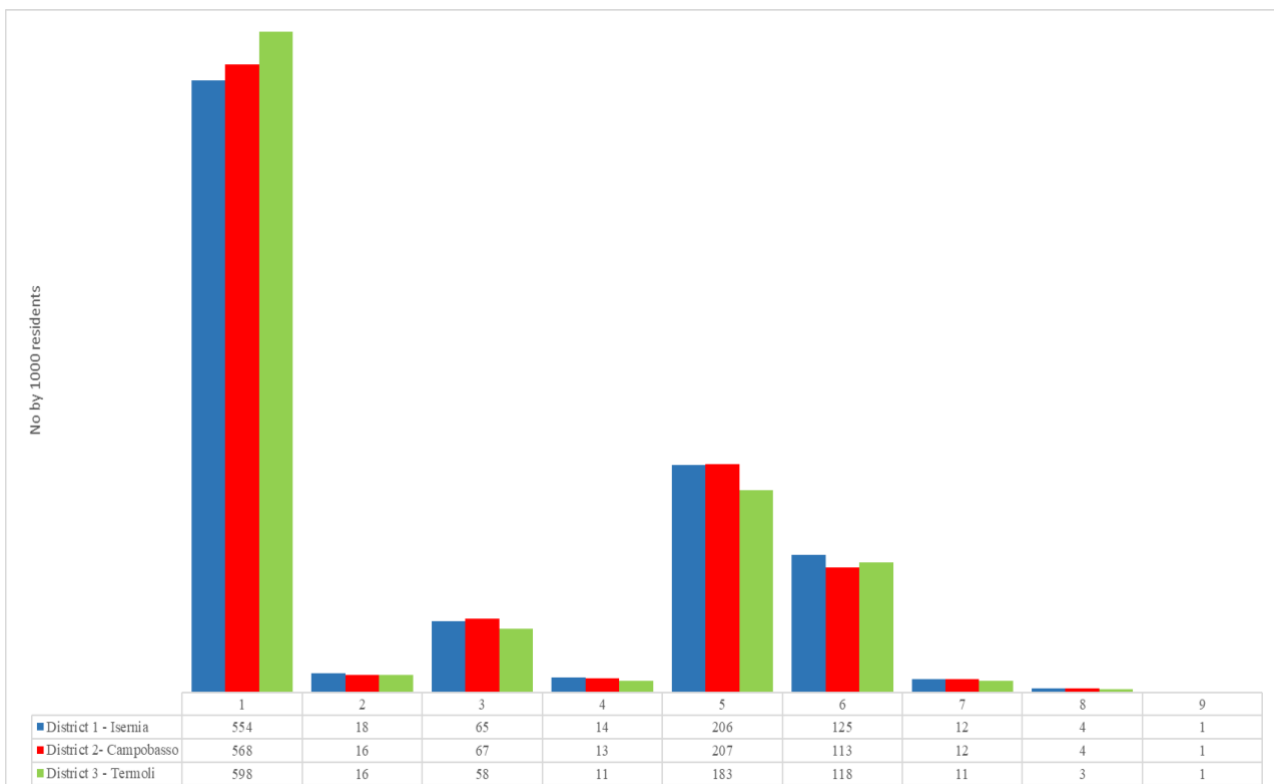
District 2 CAMPOBASSO



District 3 TERMOLI

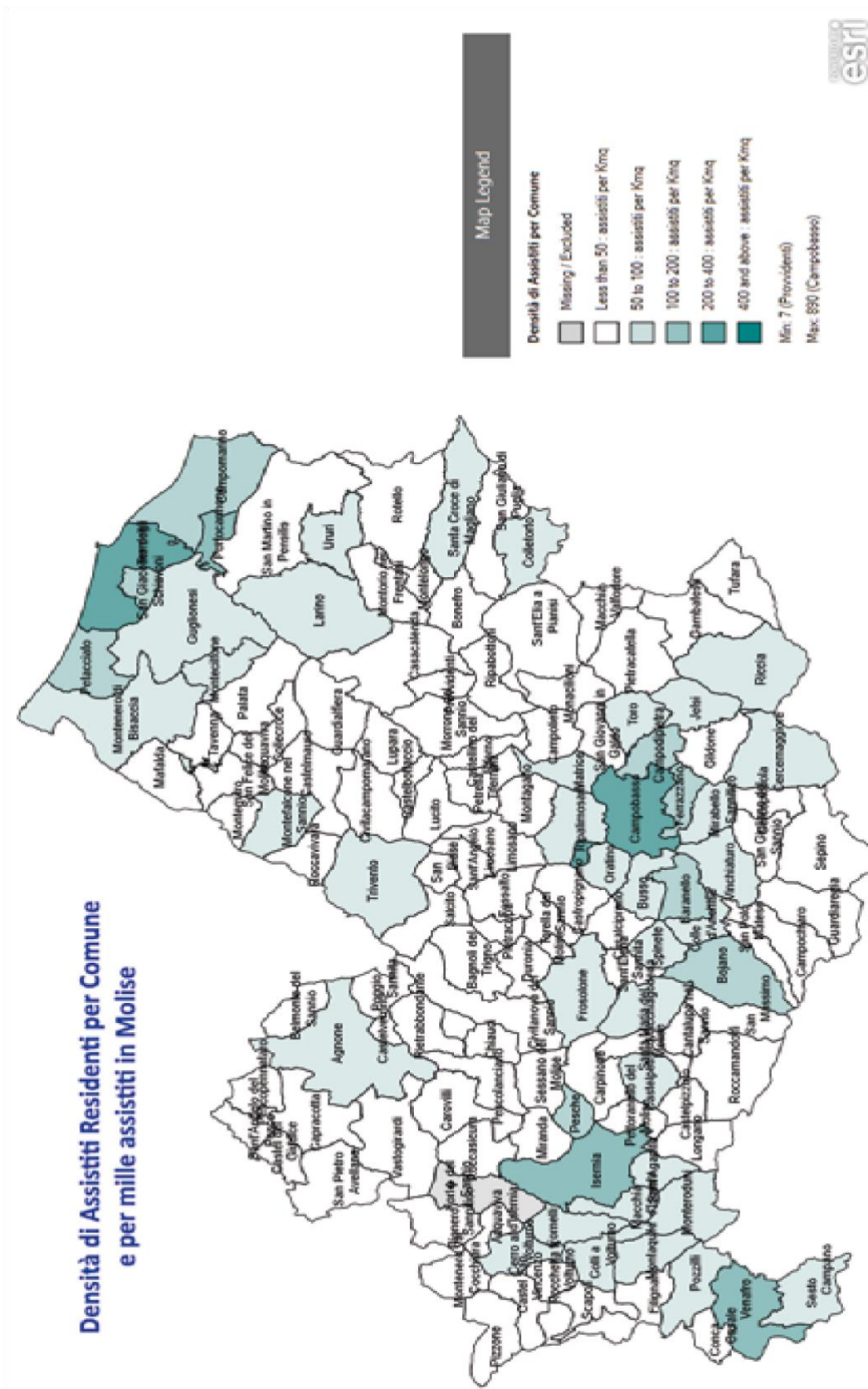


It is clear, from the graphic representations above that there are some differences in the distributions of condition across the region, in terms of level of severity, and according to the districts. This means regional and business planning must move to towards the construction of "tailored" organizational forms, i.e. to modify the presence of specialists, health care facilities and welfare policies in accordance with where the data indicates there is the greatest need.



The database was used to assess the distribution of some significant conditions in the different areas of Molise (distribution by municipality), calculating the prevalence within those populations.

Molise is a region with very low population density areas, as can be seen from the map below.



The overall population of Molise with health status from 3 to 9. This included chronic diseases, malignancies under active treatment and catastrophic conditions with a distribution by municipality, described by prevalence per 1,000 enrollees, is reported in the following map.

