

## FORECASTING NEEDS ON GENERAL PRACTITIONERS ON THE BASIS OF ATTACHED POPULATION IN OUTPATIENT CLINICS OF ALMATY CITY

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### ANNOTATION

Health human resources forecasting is one of the key components of health human resources planning. Planning quality depends on proper assessment of the labor market and forecasting the needs of the population. There are many types of forecasting, however, the easiest approach is the forecast based on the number of attached population. In this regard, the purpose of this research is to forecast needs for general practitioners based on attached population in Almaty city. The forecast was made on the basis of statistical data of the Health Department of Almaty city and on the basis of survey that was conducted among 11 out of 34 outpatient clinics of Almaty city. The forecast was made on the basis of SPSS Statistics software. For outpatient clinics, where attached population has a tendency to growth, the Holt method was used, and for outpatient clinics, where the attached population has a tendency to decrease, a damped forecasting method was used. The results of study show that the need on general practitioners among 11 outpatient clinics in occupied positions was 8.5 positions, while the need in physical persons was 14.5. The forecasted need on general practitioners for 11 outpatient clinics shows that the need for general practitioners will be 304 positions, with a staff standard of 2,000 populations per 1 general practitioner, by 2023. As well as, the need for general practitioners and with a staff standard of 1,500 populations per 1 general practitioner, will amount to 405.5. An assessment of actual need for general practitioners within Almaty city shows that with a staff standard of 2,000 populations per 1 general practitioner will be 1215, and according to staff standard of 1,500 populations per 1 general practitioner the need will be 1559, by 2023.

**Key words:** forecasting, health human resources, general practitioners, nurses.

General practitioners and nurses are key personnel in primary health care. General practitioners and nurses play the role of coordinators in the health care system as they carries out primary reception of patients [1]. In this regard, a huge burden is falling on general practitioners and nurses, as the number of home visits and outpatient clinics attendance increase annually.

In the domestic health care system there are many other challenges associated with physicians and nurses. In order to timely, prevent existing challenges in the health care system and take appropriate measures, it is necessary to properly forecast the possible needs for health human resources [2, 3, 4, 5, 6, 7].

Nowadays, forecasting the needs for primary care professionals in Kazakhstan is carried out by one of the following methods [8]:

1. Forecasting based on attached population;
2. Forecasting based on establishment of target indicators.

Both methods have advantages and disadvantages. Forecasting needs based on attached population is the easiest approach, but this forecasting may be not realistic, since this method does not take into account key variables that can affect the need for health human resources.

The method based on indicators is also one of the easiest methods, but it has the

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disadvantage of establishing indicators based on subjective opinion.

However, in this study, the forecasting of needs for general practitioners will be made based on the ratio of population to general practitioners.

**The purpose of the study:** Forecasting the need for general practitioners based on the number of population in Almaty city and forecasting the need for general practitioners in outpatient clinics based on attached population.

**Methods and materials.** Required materials were obtained from 11 outpatient clinics of Almaty city and from statistical report of the Health Management of Almaty city. In this study were selected outpatient

clinics that have relatively large staffing capacity of general practitioners and nurses. The staff data of outpatient clinics were obtained through a conducting questionnaire for personnel department and statistical department of outpatient clinics of Almaty city, within the framework of PhD dissertation: “Scientific approaches to the methodology of forecasting health human resources (in the example of general practitioners and nurses, in a metropolis)».

**Objects of research:** The objects of research are 11 polyclinics of Almaty city and general practitioners.

In this study, the following coefficients were determined based on the following formulas:

1. Turnover rate of medical workers

$$\text{Turnover rate} = \frac{\text{Dismissed by own will} + \text{Dismissed by administrative reasons}}{\text{average number of employees}} \times 100$$

2. Hiring rate of medical workers

$$\text{Hiring rate} = \frac{\text{Hired}}{\text{average number of employees}} \times 100$$

3. Rate of medical workers over 58 year

$$\text{Rate of medical workers over 58 year} = \frac{\text{medical workers over 58 year}}{\text{average number of employees}} \times 100$$

4. Rate of concurrent staff

$$\text{Rate of concurrent staff} = \frac{\text{Occupied positions}}{\text{Individuals}}$$

5. Forecasted need on general practitioners

$$\text{Forecasted need on general practitioners} = In + Inf + (Tr - Hr) + R58$$

Where:

In – the need for individuals on current year, based on the staff standards of 2000 population to 1 general practitioner, and 1500 population to 1 general practitioner

Inf – the need for individuals on forecasted year, based on the staff standards of 2000 population to 1 general practitioner, and 1500 population to 1 general practitioner

Tr – turnover rate

Hr – hiring rate

R58 – Rate of medical workers over 58 year

The forecast was made on the basis of SPSS Statistics software. For outpatient clinics, where attached population has a tendency to growth, the Holt method was used, and for outpatient clinics, where the attached

population has a tendency to decrease, a damped forecasting method was used.

Results. First of all, the existing need for general practitioners was determined. The research results show that among 11 outpatient

clinics, the need for individuals is higher than the need for occupied positions. For example, the need for occupied positions was 8.5, while the need for individuals was 14.5 positions (Table 1).

**Table 1.** Staff data of 11 outpatient clinics of Almaty city (general practitioners).

Outpatient clinics	Established positions	Occupied positions	Vacancy	Individuals
1	21	15	6,0	15
2	29	29	0	28
3	22	22	0	22
4	29	29	0	27
5	28	28	0	26
6	16	16	0	16
7	23	22	1,0	22
8	30	30	0	30
9	18,5	18	0,5	17
10	18	18	0	18
11	17	17	1,0	16
Total	251,5	244	8,5	237

The need among nurses is higher than among general practitioners. The need for nursing occupied positions was 11, while the need for individuals was 69 positions. It is worth noting that the ratio of general practitioners and nurses

was 2.4, which is lower than recommended level by World Healthcare Organization, which is 3 nurses per doctor. If we calculate the need for nurses on the basis of international standards, the need will increase significantly (Table 2).

**Table 2.** Staff data of 11 outpatient clinics of Almaty city (Nurses).

Outpatient clinics	Established positions	Occupied positions	Vacancy	Individuals	General practitioners/ Nurses ratio
1	55	54	1,0	54	2,6
2	58	58	0	54	2,0
3	66	66	0	66	3,0
4	58	58	0	58	2,0
5	84	84	0	52	2,0
6	32	32	0	32	2,0
7	69	59,5	9,5	57	2,47
8	90	90	0	89	2,96
9	48	47,5	0,5	35	2,05
10	36	36	0	36	2,0
11	42	42	0	36	2,25
Total	638	627	11	569	2,4

Analysis of health human resources shows that the turnover rate of general practitioners is 22.3%, while the rate of recruitment was only 18.9%. These data show that outpatient organizations lose 3.4% of

general practitioners per year. The turnover rate of nurses is 19.6%, while the rate of hiring is only 10.9%. As a result, the loss in nurses is 8.7% per year, which is higher than that of general practitioners (Table 3).

**Table 3.** The dismissed and hired personnel rate.

	Individuals	Dismissed	Hired	Turnover rate	Hiring rate
General practitioners	237	53	45	22,3%	18,9%
Nurses	569	61	34	19,6%	10,9%
Loss in human resources					
General practitioners			3,4%		
Nurses			8,7%		

The rate of concurrent staff shows that general practitioners and nurses realizes additional work due to the lack of human resources. The rate of concurrent general practitioners according to the study was 1.02, which indicates a low need for general

practitioners, and among nurses this rate was 1.1, which means that nurses overworking for 10% due to staff shortages. Concurrent data once again proves the great shortage of nurses among selected 11 outpatient clinics of Almaty city (Table 4).

**Table 4.** The rate of concurrent staff.

Total	General practitioners	Nurses
Occupied positions	244	627
Individuals	237	569
The rate of concurrent staff	1,02	1,1

The coefficient of general practitioners over 58 years old (58 years inclusively) was 2.3% of the total number of general practitioners. The rate of nurses over 58 years old (58 years inclusively) was 1.6% of the total number of nurses. The results show that the proportion of general practitioners and nurses above 58 years is low. The results of the study show that attached population in the majority outpatient clinics of Almaty

city tends to grow. The total number of attached population in 11 outpatient clinics will reach 608581, by 2023, whereas in 2017 the number of attached population was 552450. This data shows that in next 6 years the number of attached population in 11 outpatient clinics will grow by 9.3%. These indicates that in the future the need for general practitioners will increase (Table 5).

**Table 5.** The forecast of the attached population of 11 outpatient clinics, until 2023.

Outpatient clinics	2015	2016	2017	2018	2019	2020	2021	2022	2023
1	63607	62884	63278	64855	66432	68008	69585	71161	72738
2	61047	61772	62755	63235	64038	64840	65642	66444	67246
3	57385	57857	57851	58049	58591	59059	56464	59814	60116

4	51486	55082	58174	55551	55109	54668	54227	53785	53344
5	64616	64231	64675	64040	63752	63464	63176	62888	62600
6	38125	30553	29852	31385	30959	30534	30111	29690	29270
7	45833	44832	45888	45904	45584	45264	44645	44626	44307
8	66379	67760	60776	64525	64480	64455	64442	64436	64432
9	31446	32828	34785	35161	36267	37374	38480	39587	40693
10	36803	35672	37626	42333	45345	48357	51369	54381	57393
11	30674	38690	36790	41152	42210	47268	50326	53384	56442

The forecasted need on general practitioners for 11 outpatient clinics shows that the need for general practitioners will be 304 positions, with a staff standard of 2,000 populations per 1 general practitioner, by 2023. The deficit in general practitioners will be 106 individuals, if we take into account the actual need of clinics in general practitioners (in 2017 the need in general practitioners was 39, according to attached population). Lost in general practitioners and lost associated with aging of general practitioners in the next 6 years will make up 19.3% of the 237 general practitioners. Taking into account all losses, the total forecasted deficit for general

practitioners among 11 outpatient clinics will be 151.7 individuals, by 2023.

The forecasted need on general practitioners for 11 outpatient clinics shows that the need for general practitioners will amount to 405.5 positions, with a staff standard of 1,500 populations per 1 general practitioner, by 2023. The deficit in general practitioners will be 168.5 individuals. If we take into account the actual need of clinics in general practitioners, the total deficit will be 207.5 individuals. Taking into account all losses, the total forecasted need for general practitioners among 11 outpatient clinics for 2023 is 253.2 individuals, by 2023 (Table 6).

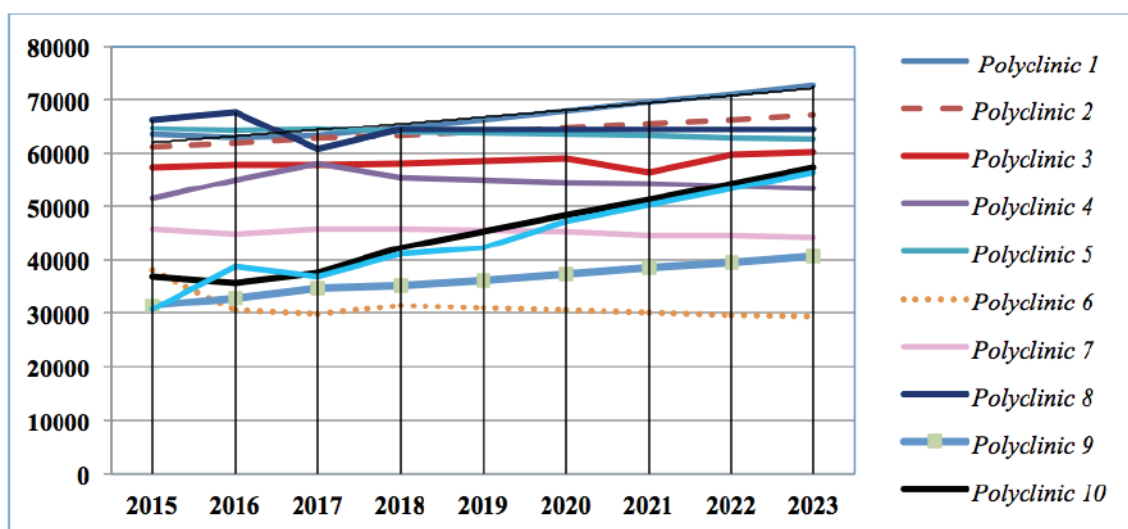
**Table 6.** Forecasting the need on general practitioners for 11 outpatient clinics till 2023.

Outpatient clinics and number of general practitioner	Staff standard for 1 general practitioner	2015	2016	2017	2018	2019	2020	2021	2022	2023
		1 (15)	2000 pop.	32	31,5	31,6	32,4	33,2	34	34,8
	1500 pop.	42,4	41,9	42,1	43,2	44,2	45,3	46,4	47,4	48,5
2 (28)	2000 pop.	30,5	30,8	31,4	31,6	32	32,4	32,8	33,2	33,6
	1500 pop.	40,7	41,2	41,8	42,2	42,7	43,2	43,8	44,2	44,8
3 (22)	2000 pop.	28,6	28,9	28,9	29	29,3	29,5	28,2	29,9	30
	1500 pop.	38,3	38,6	38,6	38,7	39	39,4	37,6	39,8	40
4 (27)	2000 pop.	25,7	27,5	29	27,8	27,5	27,3	27,1	26,9	26,7
	1500 pop.	34,3	36,7	38,8	37	36,7	36,4	36,1	35,8	35,6
5 (26)	2000 pop.	32,3	32,1	32,3	32	31,8	31,7	31,5	31,4	31,3
	1500 pop.	43	42,8	43,1	42,7	42,5	42,3	42,1	41,9	41,7
6 (16)	2000 pop.	19	15,2	14,9	15,7	15,5	15,3	15,05	14,8	14,6
	1500 pop.	25,4	20,4	19,9	20,9	20,6	20,4	20	19,8	19,5
7 (22)	2000 pop.	22,9	22,4	22,9	22,9	22,8	22,6	22,3	22,3	22,1
	1500 pop.	30,5	29,8	30,5	30,6	30,4	30,2	29,7	29,7	29,5

8 (30)	2000 pop.	33,2	33,8	30,4	32,3	32,2	32,2	32,2	32,2	32,2
	1500 pop.	44,2	45,2	40,5	43	42,9	42,9	42,9	42,9	42,9
9 (17)	2000 pop.	15,7	16,4	17,4	17,6	18,1	18,7	19,2	19,8	20,3
	1500 pop.	20,9	21,8	23,2	23,4	24,2	24,9	25,6	26,4	27,1
10 (18)	2000 pop.	18,4	17,8	18,8	21,2	22,7	24,2	25,7	27,2	28,7
	1500 pop.	24,5	23,7	25	28,2	30,2	32,2	34,2	36,3	38,3
11 (16)	2000 pop.	15,3	19,3	18,4	20,6	21,1	23,6	25,1	26,7	28,2
	1500 pop.	20,5	25,8	24,5	27,4	28,1	31,5	33,5	35,6	37,6
Total need in staff standard 1 general practitioners to 2000 population		273,6	275,7	276	283,1	286,2	291,5	293,9	300	304,1
Total need in staff standard 1 general practitioners to 1500 population		364,7	367,9	368	377,3	381,5	388,7	391,9	399,8	405,5
Deficit in staff standard 1 general practitioners to 2000 population		-	-	39	46,1	49,2	54,5	56,9	63	67,1
Deficit in staff standard 1 general practitioners to 1500 population		-	-	131	140,3	144,5	151,7	154,9	162,8	168,5

An analysis of the need on general practitioners at outpatient clinics shows that clinics numbered 1,2,3,8,9,10,11 will tend to have more general practitioners, due to the projected growth of attached population. Controversially, outpatient

clinics numbered 4, 5, 6, 7 will tend to have lower general practitioners, due to the projected decrease in the attached population. An analysis of the need on general practitioners by polyclinics is shown in Picture 1.



Picture 1. Forecasted need on general practitioners until 2023.

The forecasted need on general practitioners for Almaty city shows that the need on general practitioners will be 1062

positions, with a staff standard of 2,000 populations per 1 general practitioner, by 2023. Taking into account all losses, the total



forecasted need for general practitioners for Almaty city will be 1,215 positions.

The forecasted need on general practitioners will be 1416 positions, with a staff standard of 1500 populations per 1

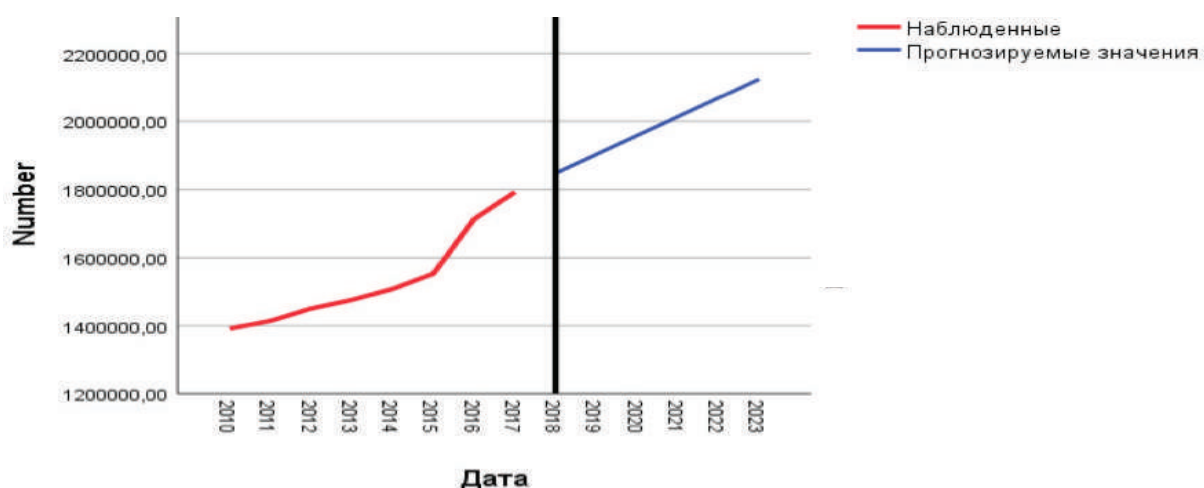
general practitioner, by 2023. Taking into account all losses, the total forecasted need for general practitioners for Almaty city will be 1569 positions. Forecasted need on general practitioners illustrated in Table 7.

*Table 7. Forecasted need on general practitioners in Almaty city.*

Years	Population	Need on general practitioners with a staff standard of 2,000 populations per 1 general practitioner	Need on general practitioners with a staff standard of 1500 populations per 1 general practitioner
2010	1391095	695,5	927,4
2011	1414017	707	942,6
2012	1450327	725,2	966,8
2013	1475579	737,8	983,7
2014	1507509	753,7	1005
2015	1552349	776,2	1034,8
2016	1713220	856,61	1142
2017	1792500	896,2	1195
2018	1847768	923,8	1231,8
2019	1903037	951,5	1268,7
2020	1958305	979,1	1305,5
2021	2013574	1006,8	1342,4
2022	2068843	1034,4	1379,2
2023	2124112	1062	1416

The projection of the number of population of Almaty city shows that the population city will

exceed 2 million people (2124112), by 2023. This forecast is shown in picture 2.



*Picture 2. Projection of Almaty population size, until 2023.*

**Conclusion.** The results showed that the turnover rate is more than the hiring rate among 11 outpatient clinics. In this regard, outpatient

clinics lose 3.4% of general practitioners. This means that until 2023, the clinics will lose 17% of general practitioners from the total

number of individuals. Therefore, a loss of 17% was included as one of the components of the need while forecasting the need in general practitioners. As well as, the share of aging general practitioners was taken into account while forecasting the needs on general practitioners. Among 11 outpatient clinics, share of aging general practitioners was 2.3%.

The vacancy for general practitioners among 11 outpatient clinics in the study was 14.5 individuals in 2017. But an analysis of attached population among 11 outpatient clinics in 2017 shows that the need on general practitioners with a standard of 2000 population per 1 general practitioner was 39.

Attached population of clinics and

population of Almaty city have a tendency to growth until 2023. In this regard, the projected need of general practitioners among 11 clinics and need on general practitioners within Almaty city forecasted to grow.

All obtained data show that, there is no big deficit in general practitioners in 2017, but it will grow and consists 1,215 individuals by 2023. Moreover the need on general practitioners will be 1569 individuals with a staff standard 1500 people per 1 general practitioner by 2023.

Taking into account the results of study, outpatient organizations should pay attention to working environment and recruitment of general practitioners, since by 2023 the need for general practitioners will be doubled.

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Министерство здравоохранение и социального развития. Методы планирования и прогнозирования кадровых ресурсов здравоохранения в условиях обязательного социального медицинского страхования: Методические рекомендации. МЗ и СР РК. – Астана: 2016.- С.8.

## ТҮЙІНДІ

Денсаулық сақтаудағы кадрлық ресурстарды болжамдау – денсаулық сақтаудағы кадрлық ресурстарды жоспарлаудың негізгі компоненттерінің бірі болып табылады. Жоспарлаудың сапасы еңбек нарығына жүргізілген талдау сапасымен тікелей байланысты. Халықаралық тәжірибеде болжамдаудың көптеген әдістері бар, бірақ болжамдаудың



ең жеңіл әрі тез әдістерінің бірі тіркелген халық санына байланысты болжамдау болып табылады. Сондықтан зерттеу мақсаты Алматы қаласындағы жалпы тәжірибелі дәрігерлер қажеттілігін тіркелген халық саны бойынша анықтау болып табылады. Болжамдау Алматы қаласы денсаулық сақтау басқармасының ақпаратына және Алматы қаласының 11 амбулаторлық-поликлиникалық ұйымдарының арасында жүргізілген анкеталық зерттеу нәтижесіне сүйене отырып жүргізілді. Болжамдау SPSS Statistics бағдарламасы арқылы әзірленді. Тіркелген халық саны өсу тренді анықталған поликлиникаларға болжамдау Хольт әдісі бойынша жүргізілді, ал халық саны төмендеу тренді анықталған поликлиникаларға болжамдау демпфирленген әдіс арқылы жасалынды.

Зерттеу нәтижесіне сәйкес 11 поликлиниканың жалпы тәжірибелі дәрігерлерлікпен айналысушылар лауазымдары бойынша қажеттілігі 8,5, ал физикалық тұлғалары бойынша қажеттілігі 14,5 екендігі анықталды. 2023 жылға дейінгі 11 поликлиника арасындағы 1 тәжірибелі дәрігерге 2000 халық стандарты бойынша қажеттілік болжамы 304 көрсетсе, 1 тәжірибелі дәрігерге 1500 халық стандарты бойынша қажеттілік болжамы 405,5 екендігі анықталды. Тура сол сияқты Алматы қаласының 1 тәжірибелі дәрігерге 2000 халық стандарты бойынша қажеттілік болжамы 1215 болса, 1 тәжірибелі дәрігерге 1500 халық стандарты бойынша қажеттілік болжамы 1559 болатындығы болжанды.

**Кілт сөздер:** болжамдау, кадрлық ресурстар, жалпы тәжірибелі мейірбикелер, мейірбикелер.

## АННОТАЦИЯ

Прогнозирование кадровых ресурсов здравоохранение – это один из основных компонентов планирования кадровых ресурсов здравоохранение. Качественное планирование зависит от качественной оценки рынка труда и прогноза потребностей населения. Существует множество видов прогнозирования, но одним из легких в применении видов прогнозирования является прогноз на основе количество прикрепленного населения. В связи с этим целью данного метода является прогнозирования потребности во врачах общей практики на основе количество населения, в рамках города Алматы. Прогноз сделан на базе статистических данных управления здравоохранения города Алматы и проведенного анкетирования среди 11 из 34 поликлиник города Алматы. Прогноз был осуществлен на основе программного обеспечения SPSS Statistics. Для поликлиник, где прикрепленное население имеет тенденцию роста, использовался метод Хольта, и для поликлиник, где прикрепленное население имеет тенденцию снижения, использовался демпфированный метод прогнозирования.

Результаты исследования показывают, что потребность во врачах общей практики среди 11 поликлиник в занятых должностях составил 8,5 тогда как потребность в физических лицах, составил 14,5 ставок. Прогноз потребности в 11 поликлиник показывает что до 2023 года потребность во врачах общей практики при нормативе 2000 населения на 1 врача общей практики, составит 304, а при нормативе 1500 населения на 1 врача общей практики, составит 405,5. Оценка потребности во врачах общей практики в рамках города Алматы показывает, что до 2023 года потребность во врачах общей практики при нормативе 2000 населения на 1 врача общей практики, составит 1215. Потребность во врачах общей практики при нормативе 1500 населения на 1 врача общей практики, составит 1559.

**Ключевые слова:** прогнозирование, кадровые ресурсы здравоохранения, врачи общей практики, медицинские сестры.