Project report - Children at risk

Introduction:

The research “Resilience among individuals who experience childhood adversity” by Dr. Talia Schwartz-Tairy, studies the influence of social workers on children at-risk who had childhood trauma in terms of aspirations for the future, mental strength, and their sense of capability to manage adult independent living. Talia's long-time research is the first of its kind. Moreover, to date, no analysis has been performed over its last survey.

One of the parameters asked in the survey is the type of military service (if done). The Israeli military is well known as a 'melting pot' that exposes youth to diverse populations and cultures. Also, the military is a life experience in which youth become mature and get a chance to cope with bureaucracy and problem solving. Thus, we estimate that military service (military/ national) improves the sense of hope and capability of children at-risk.

The most similar prior research checked how pre-military preparatory program influence children at risk. The focus on the influence of the pre-military preparatory program and not the army itself. Other studies conducted on specific groups such as girls and immigrants from Ethiopia.

Hence, our research question is: **Had the aspirations for the future and sense of capability of children at-risk improved under the influence of military service, and in what manner.**

According to Defence and Society Department One of the main missions of the army is to strengthen youth of all backgrounds, including youth at risk and young men and women with special needs, preparing them for military service (or national civil service), and integrating them into Israeli society post-service.

We believe analysis like our own could provide a tool to pre-identify children at-risk who are liable to develop low sense of hope and capability in adulthood, and counsel them to serve the type of military service that could raise their sense of hope in order to give them a chance to live a better life.

Data overview:

The data consists of 618 entities, each entity represent set of answers for a specific survey of a specific child. The research includes three surveys, hence there are three entities for each child (overall there are 206 children). There are features is 33 about gender, religion, number of boarding school he moved, questions about military service, aspirations for the future, heath condition and adverse events.

This feature will help us understand the effect of military service on different children.

Methods and results:

We define “Hope” as the sum of future expectations features such as: will the child has his own car/apartment, will he reach academic degree and so on.

Firstly, we done some hypothesis tests to understand the difference in “Hope” between groups.

H_0	$Hope\_A = Hope\_C$	$Hope_{sureved} = Hope_{not\ sureved}$	$Hope_{male\ sureved} = Hope_{male\ not\ sureved}$	$Hope_{feamle\ sureved} = Hope_{feamle\ not\ sureved}$
H_1	$greater$	$greater$	$greater$	$greater$
$\mathbf{P} - value$	0.0008032	0.3684	0.07335	0.784

Initially, our first hypothesis is that there is an improvement in the sense of hope among children at-risk at their adulthood which ended up with significant of 0.0008 which mean that there is very

likely that hope at their adulthood (survey 3) is higher than the hope at the first survey (see appendix 1).
Then we test if the hope at children at-risk who did military service (military/ national) is higher than the hope of those who didn't serve.
However, we found that children who served in the army may had a higher hope, but it wasn't significant. We also found an interesting inequality between male and female which can be effected by the Warfare rolls they can reach and the service duration.

The first decision that we had to make is how to find ML model that can help us answer our research question. It turned to be very difficult stage as none of our ideas served this goal in direct way. In the end we navigate our way with some potential leads.

Our first work direction was to predict the 'hope' at the third survey, after the army period, in order to find the features that has the highest influence. Finding those features could help us understand the importance of the roll that army serving plays on improving the hope of children at risk. The overall results we reached:

Model	Random Forest	Support Vector Regression	Decision Tree Regression	Multiple Linear Regression	Quantile regression
MSE	10.6	8.77	13.55	10.81	11.71
RSQRE	0.168	0.21	0.104	0.142	0.09

As shown, we implemented several regression models upon the data, which none of them had a reasonable r squared. Thus we deduced that regression models, by the way we implemented them, won't contribute to our research. We believe that this result came due to the source of the data, the difficulty of define "hope", subjective concept, that can be expressed differently.

Another predication that we assume can shed light on our question is whether the hope of the child will increase or decrease in the second survey, which was at the army stage for most of the children.

The features we choose for this classification is:
1. Religiousness – The religious proximity of the child [1-5].
2. Permanency- The number of boarding schools the child pass [1-4].
3. N. Traumas – The number of traumatic events the child experienced [5-9].
4. Served – Dose the child served in the army (or done national service)[No, Yes]
5. Hope_A – The amount of "Hope" the child had at the first survey [11-44]

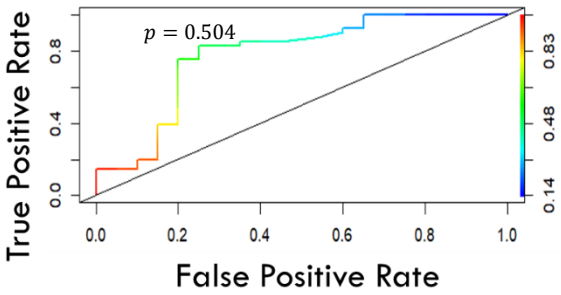
We will try to predict whether the Hope_B (The amount of "Hope" the child had at the second survey) is greater than Hope_A (No, Yes).
Using logistic regression we were able to reach some good results:

- Accuracy = $\frac{34+15}{34+15+7+5} = 80.32\%$
- Precision = $\frac{34}{34+7} = 82.92\%$
- Recall = $\frac{34}{34+5} = 87.18\%$
- F1-score = $\frac{2 \cdot 0.8292 \cdot 0.8718}{0.8292+0.8718} = 85\%$

		Actual: Increase	Actual: Decrease
Predicted	**Increase**	34	7
	Decrease	5	15

We used cross-validation to get better test results and ROC curve to find the best threshold.

When we looked on the significant level of our features we saw that 'served' had p value of 0.937 which mean that it has no effect on the class the model select.



We looked for stronger connection, so we tried to exploit the result of the third hypothesis tests and focus on the influence on men.

As we filter the men from our model, we witness improved model with better results:

- Accuracy = $\frac{12+15}{12+15+1+2} = 90\%$
- Precision = $\frac{15}{15+2} = 88.23\%$
- Recall = $\frac{15}{15+1} = 93.75\%$
- F1-score = $\frac{2 \cdot 0.8823 \cdot 0.9375}{0.8823+0.9375} = 90.9\%$

Predicted \ Actual	Increase	Decrease
Increase	15	2
Decrease	1	12

But still, the significant level of 'served' was too high. Thus we concluded that our attempts to show positive connection between military service and hope has failed. In the other hand, the feature that had the most significant p value is 'Hope_A' with negative effect which mean the higher the hope at the first survey, the more likely it will decrees. This result may obtained due to facing the realty outside of the boarding school. Another possible cause is our definition of 'Hope', which is bounded, thus initial high hope has less room to grow and more likely will stay the same or go down.

Limitations and future work:

Our initial goal was to create classifier who would recommend children at risk which kind of surveys is best for them. Unfortunately we couldn't find the right connections and patterns to recommend properly. We believe that with more observation and more time it can be done and influence the future of children at risk in Israel. Finding an alternative model turned to be harder than we predicted. In addition, one of the main difficulties was to define 'hope' which can be improved with collaboration with expert from the field.

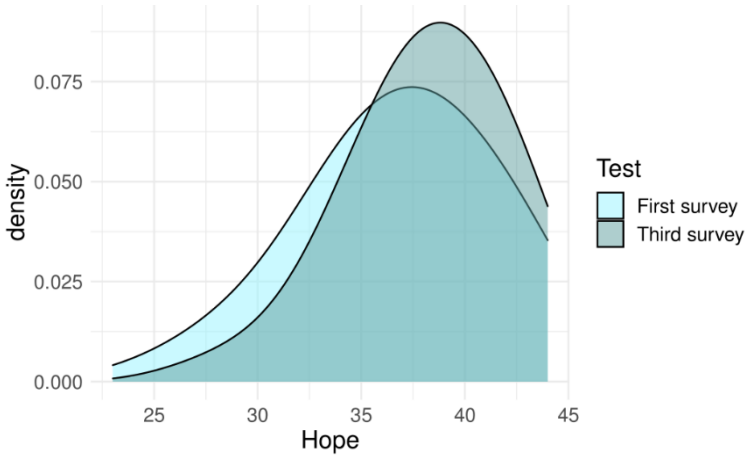
Final conclusions:

Dose the aspirations for the future and sense of capability of children at-risk improved under the influence of military service? Not sure.

By the data overview we saw higher hope among children who served in the army but it wasn't significant, according to the hypothesis test. Our classification models reached good results but didn't pushed us toward our goal. Along the way we found some interesting connections between gender and the hope in the second survey, as well as, between initial hope and the hope in the second survey. We had great experience working on this project and acquire tools for future work.

Appendix

Graph (1) - Sense of hope across children at risk at first survey and last



We can deduce that the sense of hope after military period improved compered their sense before.