



# **Social and Economic Effect of Comprehensive Prevention of Fetal Alcohol Syndrome and Fetal Alcohol Spectrum Disorders in Children: A Review**

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## **Authors' contributions**

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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## **ABSTRACT**

**Introduction:** Maternal alcohol consumption during pregnancy and its effects on the developing fetus are a serious global healthcare issue. The damage caused by alcohol goes far beyond mother's health and spreads to the child's physical and mental health.

**Aim of Review:** Analysis of existing approaches in organizing the necessary rehabilitation programs and preventing the consequences of drinking alcohol during pregnancy, assessing the potential socio-economic effect of organizing comprehensive prevention of fetal alcohol syndrome (FAS) and fetal-alcohol spectrum of disorders (FASD).

**Materials and Methods:** Children with FAS and influence of consequences of FAS/FASD on the nation's material well-being conducted in Russia and abroad were analyzed by studying various published literature. Necessary rehabilitation measures for children with FAS/FASD were identified; analyzed international studies on the economic implications of the FAS/FASD; economic costs for medical and correctional services for children with FAS/FASD in Russia were assessed.

**Results:** This review found that the Not all children with FAS/FASD are mentally retarded, they have behavioral disorders and the development of the emotional-volitional sphere is significantly

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behind the age norms. So, at 10-12 years of age, these children are still not contractual and cannot remain without adult supervision even for several hours. They require ongoing parental or tutor support. The range of disorders in fetal alcohol syndrome is very diverse, therefore, each child requires an individual approach in the formation of a rehabilitation program, which significantly increases costs in general and requires the involvement of highly qualified specialists.

**Conclusion:** There is a need for additional economic calculations to scale up a comprehensive prevention program throughout the country. It is also important to note that the implementation of preventive measures does not eliminate the need for organizing assistance programs for families raising children with FAS/FASD.

*Keywords: Alcohol; fetal alcohol syndrome; children; pregnancy; economic efficiency; FAS prevention.*

## 1. INTRODUCTION

Nowadays, the problem of alcohol abuse among women of childbearing age is a pressing challenge for public healthcare worldwide, because of its effect on health of the future generation.[1,2,3,4,5].

In medical literature, fetal alcohol syndrome (FAS) and fetal alcohol spectrum disorders (FASD) in children was first mentioned more than 45 years ago [5]. According to studies, prenatal alcohol exposure does irreparable harm to the human body, causing inborn lifelong mental and physical disorders [7-12]. FAS has three diagnostic criteria: clearly defined facial dysmorphism, prenatal and postnatal growth deficiencies, and cerebrospinal dysfunction [8,13-15].

According to contemporary researchers, FAS and FASD children suffer growth and weight deficit and have specific facial features – facial abnormalities [16,13], also, they can have hearing and vision problems [17,18,9,10,3,4]. They tend to be far behind and slow in developing self-care skills compared to other children ; also, they have poor memory and attention, hyper- or hypoactive, have serious learning difficulties, lack emotional and behavioral self-control and often have poor understanding of the consequences of their actions [19,16,13].

A child suffering FAS/FASD poses a serious family and social issue. These children need a specific kind of training environment, medical care, continuous psychological assistance and increased parental control [20,21].

Their parents must undergo specific training to learn to care for children with special needs. It should be noted that their parents do need to use

family psychologists' help for a long time. Many of them must abandon their positions or look for freelance jobs [22]. A family with a FAS child must stick to a very specific regime. The public, including teachers, grandparents and friends, are not always ready to accept and understand such a family, which leads to another problem - social deprivation [17,19,23,24,16,3,22]. This period may last for decades. It causes trouble for other children who share home with FAS/FASD children [25,26,27,20,28,21]. So the aim of this research was to assess the existing approaches in organizing the necessary rehabilitation programs and preventing the consequences of drinking alcohol during pregnancy, assessing the potential socio-economic effect of organizing comprehensive prevention of fetal alcohol syndrome (FAS) and fetal-alcohol spectrum of disorders (FASD).

## 2. REVIEW OF THE LITERATURE

In this country, children with such health issues do not qualify for disability benefits. They are entitled to a free special needs preschool training, additional speech therapy and psychological help at school, additional health examinations and treatment, if necessary [29,30,16]. However, families have to radically change their life patterns (change or quit jobs), face additional expenses on special education and neuropsychology, osteopathic help, massage, family psychotherapy, physical therapy exercise, special needs classes, etc [16,31,32,22].

Governmental and family FAS childcare and training budgets are much higher than FAS prevention budgets, which could reduce the number of cases. In Russia, since 2003, the Psychology Department of the St. Petersburg State University, the Nizhny Novgorod State Teachers' University, and the University of Oklahoma Health Sciences Center (the USA),

have been performing research on this problem. Since 2005, staff of the University of Oklahoma Health Sciences Center (the USA), the St. Petersburg State University and the St. Petersburg Academy of Pediatrics have been developing educational materials concerning FAS/FASD and prevention of alcohol abuse among women of childbearing age [33,17,18,16,31,7,16,34,4]. The results of research have shown that doctors (particularly obstetricians and gynecologists) are a major source of information about health and pregnancy for women: they tend to follow their advice and tend to trust doctors rather than mass media, specific literature, advertisement, family members or friends [33-35]. A doctor can prevent irreparable in born disorders in children by taking steps to prevent a woman from drinking alcohol [34,13,36,9-37,38]. Pregnant and non-pregnant women of childbearing age are not fully aware of the alcohol's destructive influence on the fetus and known strict boundaries (restrictions) on drinking alcohol during pregnancy [39,33,29].

Currently, the alcohol consumption level in Russia is one of the highest in the world and poses a serious health risk [16,34,1,3]. Alcohol consumption among women of childbearing age is high too [29,30]. The results of research held in St. Petersburg and Nizhny Novgorod have shown that most of non-pregnant women do consume alcohol (86% women in St. Petersburg and 93% women in Nizhny Novgorod), and 20% of pregnant women have confirmed drinking alcohol during pregnancy [33]. Many women believe that a glass of "high quality" alcohol (dry red wine) during normal pregnancy into the second trimester "will do no harm to the fetus or can even be healthy". Most obstetricians/gynecologists, pediatricians and other doctors, who are not directly involved in treatment of alcohol addiction, do not have any relevant experience in discussing alcohol consumption with women or screening women, who are at risk of having FAS/FASD children [33,34,40,9,10,37].

Unfortunately, there is no relevant statistics in Russia to reflect the number of children with FAS/FASD [18]. This is explained by the fact that such a diagnosis requires an expensive comprehensive diagnosis, including a comparison of data on alcohol consumption by the mother during pregnancy, the presence of a set of cognitive deviations and physical defects in the child [29,30,16,20,3,4]. In her paper,

Malakhova Zh.A. (2012) states that FAS incidence among boarding-school type children is 139 cases per 1000 subjects, while FAS incidence among children in general is 18-19 per 1000.

In an analytical paper, U. S. scientists note that in North Dakota, the median yearly expenses on FAS children up to 21 y/o reached \$2842 in 2003, while the expenses on non-FAS children was only \$500. Scientists have calculated that prevention of one case of FAS each year could help save \$128 810 in 10 years and \$491 820 in 20 years [41].

According to research on the influence of FAS and FASD on the material well-being of Canadian public, as of 2013, costs associated with health care, law enforcement, child and youth care, special education, prevention and research expenditures combined with indirect loss due to FASD patients' poor productivity, high morbidity and mortality levels, totaled to around \$1.8 billion. The largest part of FAS-related general loss is accounted for by low productivity due to high morbidity and mortality – 41% (\$532 million to \$1.2 billion) of the general expenses. The second largest part of the loss was associated with treatment of disorders, totaling to 29% (\$378.3 million). The third largest part was due to purchase of medical equipment – 10% (\$128.5 to 226.3 million) [42].

Contemporary research demonstrates a necessity of providing medical and psychological support for families with FAS/FASD children until they are 18 y/o. A detailed list of expenditures that are common in Russia is shown in Table 1.

According to the table, the annual costs of rehabilitation of one child with FAS / FASD in Russia will average 385,133 rubles, while the total amount of expenses until the child reaches adulthood will be 6,932,400 rubles. Moreover, the table only considers the costs of medical care and correction of violations. Based on the estimates of Canadian researchers, these expenses categories account for about 40% of the total economic effect [42].

It should be noted that in addition to the costs shown in Table 1, there are expenses for tutoring such children, as well as losses associated with their reduced working capacity in adulthood. Even though not all children with FAS/FASD are mentally retarded, they have behavioral

**Table 1. Medical and educational expenses on FAS/FASD children of different age groups [5,43]**

| No   | Type of medical/educational help for FAS/FASD children  | Unit per year | Cost (□). | Annual expenses (□) | Duration (years) | Total expenses (□) |
|--|---|---------------|-----------|---------------------|------------------|--------------------|
| <b>Early childhood (up to 3 y/o):</b>        |   |               |           |                     |                  |                    |
| 1  | Comprehensive testing: pediatrician, cardiologist, otorhinolaryngologist ophthalmologist, surgeon, gastroenterologist, ECG, echocardiography, cranial MRI, neurosonography, abdominal and thyroid ultrasonography, audiometry, impedancemetry | 1             | 42700     | 42700               | 3                | 128100             |
| 2  | endocrinologist   | 2             | 4000      | 8000                | 3                | 24000              |
| 3  | Geneticist's consultation   | 1             | 4000      | 4000                | 3                | 12000              |
| 4  | Neurologist   | 4             | 4000      | 16000               | 3                | 48000              |
| 5  | Clinical, psychological and psychodiagnostics testing   | 2             | 2900      | 5800                | 3                | 17400              |
| 6  | Clinical and psychological correction   | 12            | 2800      | 33600               | 3                | 100800             |
| 7  | (up to 1 y/o)   | 4             | 2800      | 11200               | 1                | 11200              |
| 8  | Speech therapist (1 to 2 y/o)   | 18            | 2800      | 50400               | 1                | 50400              |
| 9  | Speech therapist (2 to 3 y/o)   | 36            | 2800      | 100800              | 1                | 100800             |
| 10   | Osteopath   | 4             | 4000      | 16000               | 3                | 48000              |
| 11   | Neuropsychologist (2 to 3 y/o)  | 6             | 2500      | 15000               | 1                | 15000              |
| 12   | Orthopedic surgeon  | 3             | 4000      | 12000               | 3                | 36000              |
| 13   | Physical therapy exercises (1 to 3)   | 48            | 1500      | 72000               | 2                | 144000             |
| 14   | Pharmacological treatment   | 12            | 3000      | 36000               | 3                | 108000             |
| <b>Total expenses on 0 to 3 y/o children</b> |   |               |           |                     |                  | <b>715600,00</b>   |
| <b>Pre-school years (3 to 7 y/o):</b>        |   |               |           |                     |                  |                    |
| 1  | Endocrinologist   | 2             | 3200      | 6400                | 4                | 25600              |
| 2  | Neurologist   | 3             | 3200      | 9600                | 4                | 38400              |
| 3  | Special needs expert/special education teacher/pre-school training  | 40            | 2800      | 112000              | 4                | 448000             |
| 4  | Speech therapist  | 40            | 2800      | 112000              | 4                | 448000             |
| 5  | Osteopath   | 6             | 4000      | 24000               | 4                | 96000              |
| 6  | Neuropsychologist   | 36            | 2900      | 104400              | 4                | 417600             |
| 7  | Orthopedic surgeon  | 3             | 3200      | 9600                | 4                | 38400              |
| 8  | Physical therapy exercises/team sports  | 48            | 650       | 31200               | 4                | 124800             |
| 9  | Clinical and psychological correction   | 10            | 2800      | 28000               | 4                | 112000             |
| 10   | Family psychologist   | 12            | 4000      | 48000               | 4                | 192000             |

| No  | Type of medical/educational help for FAS/FASD children | Unit per year | Cost (□). | Annual expenses (□) | Duration (years) | Total expenses (□) |
|---|--|---------------|-----------|---------------------|------------------|--------------------|
| <b>Total expenses on 3 to 7 y/o children</b>    |  |               |           |                     |                  | <b>1940800,00</b>  |
| Children 7 to 11 y/o:                           |  |               |           |                     |                  |                    |
| 1   | Endocrinologist  | 2             | 3200      | 6400                | 4                | 25600              |
| 2   | Neurologist  | 2             | 3200      | 6400                | 4                | 25600              |
| 3   | Special school education teacher                       | 36            | 2800      | 100800              | 4                | 403200             |
| 4   | Speech therapist                                       | 36            | 2800      | 100800              | 4                | 403200             |
| 5   | Osteopath  | 3             | 4000      | 12000               | 4                | 48000              |
| 6   | Neuropsychologist                                      | 36            | 2900      | 104400              | 4                | 417600             |
| 7   | Orthopedic surgeon                                     | 2             | 3200      | 6400                | 4                | 25600              |
| 8   | Sports   | 80            | 650       | 52000               | 4                | 208000             |
| 9   | Clinical and psychological correction                  | 18            | 2800      | 50400               | 4                | 201600             |
| 10  | Clinical, psychological and psychodiagnostics testing  | 4             | 2900      | 11600               | 4                | 46400              |
| 11  | Family psychologist                                    | 12            | 4000      | 48000               | 4                | 192000             |
| <b>Total expenses on 7 to 11 y/o children</b>   |  |               |           |                     |                  | <b>1996800,00</b>  |
| Children 11 to 18 y/o:                          |  |               |           |                     |                  |                    |
| 1   | Endocrinologist  | 1             | 3200      | 3200                | 7                | 22400              |
| 2   | Neurologist  | 2             | 3200      | 6400                | 7                | 44800              |
| 3   | Special school education teacher                       | 36            | 2800      | 100800              | 7                | 705600             |
| 4   | Osteopath  | 3             | 4000      | 12000               | 7                | 84000              |
| 5   | Neuropsychologist                                      | 18            | 2900      | 52200               | 7                | 365400             |
| 6   | Orthopedic surgeon                                     | 1             | 3200      | 3200                | 7                | 22400              |
| 7   | Sports   | 80            | 650       | 52000               | 7                | 364000             |
| 8   | Clinical and psychological correction                  | 18            | 2800      | 50400               | 7                | 352800             |
| 9   | Clinical, psychological and psychodiagnostic testing   | 2             | 2900      | 5800                | 7                | 40600              |
| 10  | Family psychologist                                    | 12            | 3300      | 39600               | 7                | 277200             |
| <b>Total expenses on 11 to 18 y/o children</b>  |  |               |           |                     |                  | <b>2 279 200</b>   |
| <b>Whole-period expenses per FAS/FASD child</b> |  |               |           |                     |                  | <b>6 932 400</b>   |

disorders and the development of the emotional-volitional sphere is significantly behind the age norms. So, at 10-12 years of age, these children are still not contractual and cannot remain without adult supervision even for several hours. They require ongoing parental or tutor support. The range of disorders in fetal alcohol syndrome is very diverse, therefore, each child requires an individual approach in the formation of a rehabilitation program, which significantly increases costs in general and requires the involvement of highly qualified specialists.

There is also an urgent need for further social support for such people: assistance in finding a job, mentoring or tutor support, leisure activities, psychological assistance in various situations.

### 3. CONCLUSION

Therefore, a lifelong assistance for people with fetal alcohol syndrome is a serious social issue. To solve it, all countries need resources, both economic and social. It is possible to reduce FAS-related expenses through implementation of effective social practices and prevention programs.

It is vital to launch a FAS/FASD prevention program nationwide. Similar programs have been successfully implemented in the USA, Canada, and Europe. As part of such a program, health care institutions should test and screen women of childbearing age on a regular basis to reveal and prevent alcohol-induced and related issues. An integrated and systemic approach to organizing FAS prevention will significantly reduce the number of FAS/FASD children. This will help the government save on treatment, care, and education of such children, as well as improve general social security and psychological comfort. The funding of FAS/FASD prevention programs can be economically efficient and beneficial for the society in general.

Therefore, organization of programs of comprehensive prevention of fetal alcohol syndrome and fetal alcohol spectrum disorders in children is vital for public health care nowadays, and it is socially and economically relevant in terms of whole-public interests for the following reasons:

1. The FAS/FASD prevention program is aimed at improving health of the public in general.
2. Most preventive measures can be organized in a group, non-individual

format, which significantly reduces the time and financial costs compared to rehabilitation programs.

3. Prevention measures are periodic (more active at the pregnancy planning and childbearing stages), while treatment of a FAS/FASD child should be continuous.
4. No specific education is required for implementing prevention programs.
5. There is a necessity to perform additional economic calculations to scale up a comprehensive prevention program nationwide.

### CONSENT

It is not applicable.

### ETHICAL APPROVAL

It is not applicable.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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