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SOCIAL STUDIES EXTENDED ESSAY

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The Society

Research Question: Does The Anti-Vaccine Movement
Affect The United States Population?

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INTRODUCTION

Our extended essay is going to analyze the phenomenon originated in 1998 by the fraudulent study of Andrew Wakefield that says that “vaccines produce autism¹”, that is actually affecting the Under-five mortality.

A vaccine is a biological medicine made up of microorganisms (dead or attenuated) or products derived from them, to generate immunity² against a certain disease, stimulating it to produce antibodies that will then act to protect against future infections, since the immune system can recognize the infectious agent and destroy it.



Before birth, babies acquire the necessary defenses through the placenta to protect themselves against possible infections during the first weeks of life. However, they lose that protection in a short time, although this varies depending on the microorganism in question. Thus, while in infectious diseases, the immunity transmitted by the mother remains only a few weeks, in other cases, such as measles³, it can last up to six months or a year, according to the children.

¹ Autism: A complex network of cells and proteins that defends the body against infection.

² Immunity system: A complex network of cells and proteins that defends the body against infection.

³ Measles: An infectious viral disease causing fever and a red rash on the skin, typically occurring in childhood.



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This fact determines two very important things: the need to vaccinate the child for protection against the known diseases and the moment in which he must be vaccinated to maintain his immunity against them.

Vaccines are a mechanism for the control of many infectious diseases that in the past were common in this country. However, the viruses and bacteria that cause disease, and even death, still exist (although they can be prevented by vaccines) and can be transmitted to those people who are not protected by vaccines. These diseases have a great economic impact and result in medical consultations, hospitalizations and premature deaths. In addition, children's illnesses can also cause parents to miss work days.



CHAPTER ONE

The anti-vaccines (or anti-vaxxers) movement, is defined as a group of people who for different reasons, whether health, religious, scientific, political or philosophical, believe that vaccines or the action of getting vaccinated is harmful to our health. These groups provide information without truth, making the action of being vaccinated, in many countries, a difficulty.

In 1796, an English rural doctor, whose name is Edward Jenner, began using a system to prevent smallpox⁴ disease. He take some pus from a milkmaid with cowpox⁵, and put it into a cut in the arm of a boy. Later, Jenner exposed this boy to smallpox, and he discovered he was immune.

In the second half of the nineteenth century in the United Kingdom, several laws were made which required vaccination against smallpox (Vaccination Act of 1840, 1853 and 1867) in which parents who did not vaccinate their children were penalized or even jail. Before these laws, the anti-vaccination league was established in London in 1853 and after fourteen years the mandatory anti-vaccination league.

In the year 1879 a society of fight against the vaccination of the United States was founded, and after a while the League of the New England anti-compulsory vaccination (1882) and the League of the fight found of the vaccination of the states United .

⁴ Smallpox: An acute contagious viral disease, with fever and pustules usually leaving permanent scars.

⁵ Cowpox: A viral disease of cows' udders which, when contracted by humans through contact, resembles mild smallpox.



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After a mandatory legal repeal fight that applies after campaigns, the city of New York struggles to find vaccination in its cities vaccination laws in different states arguing that the laws that required vaccination violated the individual rights of people .

In 1970 a controversy emerges in several countries of the world with the vaccine against diphtheria⁶, tetanus⁷ and pertussis⁸ (DTP) thanks to a report in which it is stated that 36 children suffered neurological consequences (vomiting, irritability, seizures and spasms) , this caused the vaccination rate to decrease in the UK, this caused up to more than three epidemics.

After a few years in 1998 a report appeared in the lancet written by British doctor Andrew Wakefield in which he defends vaccination against measles, mumps⁹ and rubella¹⁰ with autism and a variety of diseases to the colon. After six years it is proven that Wakefield had financial problems, many of the work's co-authors made conclusions about it. The television vaccination rate in the UK decreases 80%.

⁶ Diphtheria: An acute febrile contagious disease typically marked by the formation of a false membrane especially in the throat and caused by a bacterium, which produces a toxin causing inflammation of the heart and nervous system.

⁷ Tetanus: A bacterial disease marked by rigidity and spasms of the voluntary muscles.

⁸ Pertussis: A highly contagious, acute respiratory illness characterized by fits of coughing and caused by the bacteria.

⁹ Mumps: A contagious and infectious viral disease causing swelling of the parotid salivary glands in the face, and a risk of sterility in adult males.

¹⁰ Rubella: A usually mild contagious viral disease characterized by fever, mild upper respiratory congestion, and a fine red rash lasting a few days.



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The consequences of the resistance of the people caused the increase in infections due to almost eradicated diseases, therefore the morbidity¹¹ and mortality¹² rate increased in several parts of the world.

This does not guarantee that the information is 100% valid. In the years of 1999/2000 an outbreak of measles appears in a religious school that did not accept vaccines, all this happened in the Netherlands.

Nigeria religious leaders refuse vaccination against polio¹³ and measles. Thanks to this, Nigeria presents more than half of the cases of these diseases.

In the state of India in 2005 there was a case of an unvaccinated girl who returned from a trip to Romania, this caused other unvaccinated children to be affected, her parents created that the vaccine was dangerous for their children.

The most recent case of measles occurred in 2014 in the United States, in Disneyland, where more than 40 people were infected, so it ended up spreading throughout the state. Studies indicate that the rate of vaccination of symptoms ranges from 50% to 86%, well below 95% I recommend to maintain community immunity.

¹¹ Morbidity: Refers to the consequences and complications (other than death) that result from a disease.

¹² Mortality: Number of people who die in a place and in a specified period of time in relation to the total population.

¹³ Polio: An infectious disease especially of young children that is caused by the poliovirus.



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At first it was spread in familiar, personal contexts and with the use of propaganda pamphlets. Then we use social advances such as presses, books, magazines, radio and television. Near the end of the twentieth century, the rise of the Internet and the increasing use of this by people, have a speaker where they expose their theories and principles

According to the National Institute of Statistics, in 74.4% of households, the internet is a basic tool for obtaining information or consulting on health issues. Women between the ages of 25 and 49 use the internet for health consultations. 3.8% of the population uses social networks as a means of consulting or clarifying doubt.



CHAPTER TWO

Points of view of anti-vaccines movement supporters:

Antigenic overload

Doctors should be aware that a recurring motto among the main anti-vaccines is that children receive too many vaccines ("too many vaccines" and "too soon") and that this causes an antigenic overload¹⁴. Robert W. "Dr. Bob" Sears writes on his website, "Wait until your baby strengthens your immune system before you overload it much more." The concept of "antigenic overload" argues that humans (particularly infants and young children) are unable to respond safely to the "large amount" of antigens¹⁵ imparted by vaccines.

An example of how this idea has been extended is that among the 236 parents who requested at least one non-medical exemption for vaccination of their children, in Wisconsin, USA, 64.9% supported the request by saying that "I am concerned that the children's immune system may be weakened by receiving too many vaccines"; It is also disturbing that among the 727 parents whose children received all the recommended vaccines, that statement was approved by 33.7%.

The anti-vaccination argument further suggests that the vaccine schedule with respect to children is "too early" for the "immature immune system" of infants and children, who are not

¹⁴ Antigenic overload: The resulting from concomitant vaccination with too many antigens.

¹⁵ Antigen: A toxin or other foreign substance which induces an immune response in the body, especially the production of antibodies.



able to process the multiple vaccine antigens. It is simple, attractive and popular to inform uninformed parents scientifically.

The anti-vaccines say that antigenic overload causes a "cytokine storm"¹⁶ or the "cascade of the immune response"¹⁷ that triggers adverse events, although there is no scientific evidence to support this concept. The authors distinguish these effects from the very real-but rare-immune phenomenon that Vaccines can cause an IgE-mediated allergy¹⁸ or an anaphylactic response, through antigenic stimulation, but they clarify that anaphylaxis¹⁹ is rare and is not entirely dependent on the volume of antigenic exposure.

While "Dr. Bob" Sears has not cited any data supporting this concept of antigenic overload, this statement continues to spread. In his 2007 book entitled "The Vaccine Book: Making the Right Decision for your children." Sears proposes an alternative vaccine program that eliminates some and delays others, often many years more than what the Advisory Committee on Immunization Practices, the American Academy of Pediatrics and the American Academy of Family Physicians currently recommends. The book has been among the 100 best-selling Amazon and has - Been publicized by several high profile celebrities such as Oprah Winfrey, who in the past did it on her television show and currently does it on her website.

¹⁶ Cytokine storm: A form of systemic inflammatory response syndrome that arises as a complication of some diseases or infections, and is also an adverse effect of some monoclonal antibody drugs, as well as adoptive T-cell therapies.

¹⁷ Cascade of the immune response: The production of antibodies, which either by themselves or by triggering other nonspecific amplifying mechanism, help to eliminate pathogenic microorganisms.

¹⁸ IgE-mediated allergy: an allergic reaction to a food.

¹⁹ Anaphylaxis: A serious allergic reaction that is rapid in onset and may cause death.



Four important lines of evidence contradict the concept of antigenic overload.

First, at the time of birth, babies come into contact with numerous microorganisms whose antigens far exceed the quantity and variety that vaccines contain.

Second, studies on the efficacy and safety of vaccines prior to licensing have not found evidence of the existence of an antigenic overload expressed in symptoms or signs of disease.

Third, studies conducted after licensing tens of billions of children who received the vaccine also found no evidence of antigenic overload or its consequences.

Fourth, in reality, infants and children receive less "antigen exposure" today following the routine childhood vaccination schedule than in the past. For example, the smallpox vaccine used in 1900 contained approximately 200 proteins and the tetanus-diphtheria-pertussis triple vaccine cell component used in the United States until the 1990s contained about 3,000 proteins. In contrast, the current United States program for the 15 vaccines recommended from birth to 5 years does not contain more than 150 proteins and polysaccharides.

Vaccines and autoimmunity

A second statement often promoted by anti-vaccines is that vaccines can lead to autoimmune diseases such as type 1 diabetes mellitus, multiple sclerosis and Guillain-Barré syndrome²⁰,

²⁰ Guillain-Barré syndrome: An acute form of polyneuritis, often preceded by a respiratory infection, causing weakness and often paralysis of the limbs.



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despite the fact that multiple high-quality studies have failed to find systematic tests of this type of associations. A recent review by the Institute of Medicine of more than 12,000 press reports and conducted by a panel of experts found no evidence of the development of any of these three autoimmune diseases as a result of vaccines.

French Public Health authorities considered that there was an association between vaccination with hepatitis B virus²¹ in adolescents and multiple sclerosis and this resulted in the suspension of the use of this vaccine in this subgroup in 1998. Despite this fear, no such association was found and the suspension was lifted, which was a shame for the French Public Health authorities, who had banned the vaccine based on pressure and fear from the public and not on scientific data. No association between vaccination with the hepatitis B virus and an autoimmune disease such as multiple sclerosis has been scientifically reported.

Similar studies have not found any association between diabetes mellitus or multiple sclerosis²² and vaccination. In general, the theoretical basis described for these autoimmune events is based on the hypothesis that a component of the vaccine "mimics" a human protein or a cellular component (in its sequence or homologizing its conformation) and stimulates the production of the antibody²³ against said component of the vaccine that will also bind to the human analog, producing damage and disease (or autoimmunity), either by autoantibodies or

²¹ Hepatitis B virus: A viral infection that attacks the liver and can cause both acute and chronic disease.

²² Multiple sclerosis: A potentially disabling disease of the brain and spinal cord (central nervous system).

²³ Antibody: A Y-shaped protein produced mainly by plasma cells that is used by the immune system to neutralize pathogens such as pathogenic bacteria and viruses.



by the presence of T cells²⁴ reactive to the antigens themselves. Said mechanism of molecular mimicry as a cause of autoimmune diseases related to vaccines has not yet been demonstrated in any vaccine licensed by the US or Europe.

However, there are temporary associations (not like the same causality) between autoimmunity and vaccines, such as the one that exists between Guillain-Barré syndrome and the swine flu virus²⁵ vaccine in 1976, idiopathic thrombocytopenic purpura²⁶ and measles-mumps-rubella (MMR) vaccine, acute disseminated encephalomyelitis²⁷ and rabies²⁸ vaccines based on rabbit central nervous system tissue²⁹ and myopericarditis³⁰ and smallpox vaccine. The last two disorders are also associated with the corresponding infection by the wild-type virus and therefore it is not surprising that the consequences of vaccination are rare.

The mechanisms of such effects are not clear and it is the subject of current studies, which are different in regard to each vaccine, but, although these effects exist (in the order of one case

²⁴ T cell: A lymphocyte of a type produced or processed by the thymus gland and actively participating in the immune response.

²⁵ Swine flu virus: A respiratory disease caused by influenza viruses that infect the respiratory tract of pigs and result in a barking cough, decreased appetite, nasal secretions, and listless behavior.

²⁶ Idiopathic thrombocytopenic purpura: An immune disorder in which the blood doesn't clot normally.

²⁷ Acute disseminated encephalomyelitis: An immune-mediated inflammatory demyelinating condition that predominantly affects the white matter of the brain and spinal cord.

²⁸ Rabies: A viral disease that causes inflammation of the brain in humans and other mammals.

²⁹ Rabbit central nervous system tissue: The spinal cords of rabbits were chronically infected by a slowly growing horse herpesvirus (a "cytomegalovirus") inoculated directly therein.

³⁰ Myopericarditis: A combination of both myocarditis and pericarditis appearing in a single individual, namely inflammation of both the pericardium and the heart muscle.



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per million excess doses administered) they are so rare that it is impossible to continue doing deep studies, because the number of people affected by the associations is extremely low, despite the administration of hundreds of millions of vaccines. In an attempt to solve this problem, taking into account the doses, a new field of study entitled "adversomics" has been opened.

This field aims to use the tools of immunogenetic biological systems, immune and bioinformatic profiles to discover the common individual mechanisms involved in the side effects of vaccines. However, even with these new techniques, it is still unlikely that rare side effects can be adequately studied, due to the extremely low number of cases available for study.

In theory, a possible mechanism seems to be molecular mimicry by which a vaccine antigen could cause the development of an autoimmune phenomenon, as proposed for the induction of arthritis after administration of the Lyme disease vaccine. Recently the potential mechanism to explain how the Lyme³¹ vaccine could induce arthritis has been discussed in detail, but it can simply be summarized that there is no data; Even two large controlled studies that support these concerns have not found evidence that the Lyme vaccine induces arthritis. In fact, the volume and diversity of antigens present in the "natural" infection support the concept that infections are more likely to lead to autoimmunity phenomena than vaccines, which is easy to observe clinically with virus infection. of the influenza that causes Guillain-Barré syndrome.

Therefore, this is the case where infections are more likely to induce autoimmune diseases — more than vaccines that protect against those infections.

³¹ Lyme: An infectious disease caused by the Borrelia bacterium which is spread by ticks.



Natural immunity versus immunity induced by vaccines

A third common complaint from the anti-vaccines is that immunity induced by "natural" infection is safer than immunity induced by the vaccine. The data are counter to such claims. For example, the risk associated with the development of the syndrome of Guillain Barré associated with the influenza virus vaccine could very well be as high as one case per million doses of vaccine administered — although this association has not been proven since the 1976 pandemic vaccination.

In contrast, the influenza virus³² killed approximately 1 in 8,300 Americans per year in the United States (especially the elderly), while pandemic influenza H1N1 influenza in the same country resulted in the loss. 2,000,000 years of life, between 2009 and 2010. The flu virus vaccine does not cause myocarditis, pneumonia, bronchitis, sinusitis, or a significant amount of job loss and school hours, while it is very clear that commonly "natural" influenza can — and in fact, does — cause these preventable comorbidities.

Although infection by the wild "natural" virus may in itself give rise to higher immunity, compared to the immunization given by the vaccine at the individual level, the population pays a high price to obtain only a small profit. For example, "natural" measles virus infection in an otherwise healthy host provides lifelong immunity, but causes death to approximately 1 in 3,000 cases, as well as countless other non-lethal and disabling complications.

³² Influenza virus: A contagious respiratory illness



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On the contrary, the measles vaccine, when administered under the corresponding license, is not associated with death (despite having administered at least billions of vaccine doses; the risk of death is not detectable by the method statistical), or with other measurable complications of a fatal nature. Likewise, with many vaccines, although not all, booster doses can be administered to overcome the possibility of shorter immunity induced by the vaccine after only one or two doses.

On the other hand, in terms of public health, it is important to highlight that immunosuppressed children and adults who cannot receive live virus vaccines depend on protection against natural infection and therefore on the high coverage rate given by the vaccine against measles and high levels of immunity of the general population (the so-called "group immunity").

In the United States, in the case of chickenpox, it is recommended that all children receive two doses of the vaccine. The most recent data (2009) from the National Immunization Survey show that 89.6% of all children aged 19 to 35 months received the first dose; The second dose is administered at 4-6 years, but the authors do not have national figures on the rate of application of the second dose.

Before starting routine vaccination against the varicella zoster virus³³, infection with that virus was the most common cause of death from preventable diseases among children in the United

³³ Varicella zoster virus: One of eight herpesviruses known to infect humans. It causes chickenpox (varicella), a disease most commonly affecting children, teens, and young adults, and shingles (herpes zoster) in adults.



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States, where between 1990 and 1996 there were an average of 103 deaths per year. cause of chickenpox Since the chickenpox vaccine was added to the American childhood vaccination program in 1995, the number of deaths has been declining each year.

On the other hand, the main risk is that those infected with the varicella zoster wild virus continue with the latent infection. Later in life, this translates into the development of herpes zoster³⁴ (shingles) in 20-30% of infected people, when the reactivation of the virus occurs due to stress, immune compromise or immunosenescence. On the contrary, the rates of herpes zoster after vaccination against chickenpox are substantially lower than after natural infection.

Thus, in summary, immunological studies support the general safety of routine vaccines in childhood and adults. There is no data to support the concept of antigenic overload, and "in fact, with routine vaccination we expose people to a lower number of antigens than in past decades."

Although phenomena that suggest autoimmune sequelae in association with systemic vaccination has occurred sporadically, this risk, although real, is small compared to the benefits of vaccination, as well as the recognition that such autoimmune phenomena occur more after natural infection than after vaccination. Finally, the nature of the immunity offered by the natural disease vaccine is sufficient to prevent infection and is much safer than that obtained by the immunity given by the natural infection.

³⁴ Herpes zoster: A common viral infection of the nerves, which results in a painful rash of small blisters on a strip of skin anywhere on the body.



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CHAPTER THREE

In the modern world we live in, it seems a lie that there are still irrational groups as ridiculous as anti-vaccines. But the truth is that they exist. And they hurt. Much more damage than we can imagine.

This was recently shown by the Centers for Disease Control and Prevention (CDC) itself with especially alarming figures and data. We talk about an increase of more than 300% in cases of measles in the United States since 2013. This country is one of the places where lobbies and collectives are more powerful, which translates into more affected by infectious diseases that can be very serious. In a few occasions the cause and effect are so clear; and more so considering that the reasons for the anti-vaccines are little less than incomprehensible.

The controversy generated by the anti-vaccines is not new, but it is growing significantly in recent years. This would not cease to be an anecdotal issue if the worst expectations of epidemiologists and experts from around the world were not being met. He had never seen such extremely clear figures. The number of measles cases during the past 2014, in the United States, reached 644 affected. It is not a trivial figure in a country that Measles has killed more than 200 million people is considered "clean" of measles. And neither is it stupid to fear this disease.

Measles is the second pandemic that has caused the most deaths in humans (with more than 200 million bodies on their backs). Currently the MMR vaccine prevents us from falling ill



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due to the paramyxovirus³⁵ that causes it. However, the unvaccinated can suffer terrible consequences ranging from lifelong skin lesions to incurable motor and neurological disorders. Not to mention death, avoided with a simple prick. But the problem does not stop there. Those affected are the perfect field for the virus to mutate and change, being able to develop different strains that could affect even the vaccinated.

Of the 644 victims, the vast majority, the CDC says, were not vaccinated, either by ignorance, or by their own will. These unvaccinated people are the front where the disease begins a possible epidemic, extended to other people who, as we said, could even be vaccinated, because of the folly. But we only talk about measles. Now let's think about the rest of infectious diseases that could be avoided thanks to the administration of a simple vaccine. These anti-vaccine groups are endangering themselves and the rest of society.

Measles resurgence

Endemic measles was eradicated from the United States in 2000 and in the entire country only 2% of preschoolers have not been vaccinated in the past two years, according to the CDC.

But the danger comes from unvaccinated population enclaves that create areas where the effect of collective immunity is lost.

In Minnesota, for example, the vaccination rate for children against measles, mumps and rubella in the Somali community fell to 42% in 2014, from 92% in 2004.

³⁵ Paramyxovirus: Any of a group of RNA viruses similar to the myxoviruses but larger and hemolytic, including those causing mumps, measles, distemper, rinderpest, and various respiratory infections (parainfluenza).



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Anti-vaccine militants "preach mostly in vulnerable populations" like this, explains Peter Hotez, director of the vaccination center at Texas Children's Hospital.

"One of the false central principles of the anti-vaccine movement is to affirm that measles is a benign and even beneficial disease," he tells AFP.

These ideas are "deliberately misleading and false" and have very real consequences, adds the doctor.

Measles can cause hearing loss, blindness, inflammation of the brain and pneumonia. The CDC says that out of every thousand infected children, one or two will die.

In the United States, among the recent measles epidemics is one in the Amish community in Ohio in 2014 with 383 cases. In 2015, 118 people were infected throughout the country and health authorities think the infection originated with a sick visitor to the Disneyland amusement park in California.



Appendix One

(Interview)

Photo of the interview



Summary of the interview

Francisco Quevedo Balcázar (uncle of Kiara, one of the members of the group that do this extended essay) is a Peruvian, with 34 years old, a scientific and doctor that is actually working and searching for new vaccines.

Talking with him, he told us about the importance of the vaccines, what he think about Andrew Wakefield, and why he think the anti-vaccines movement can be, and it's, a big problem created by the ignorance of the people.

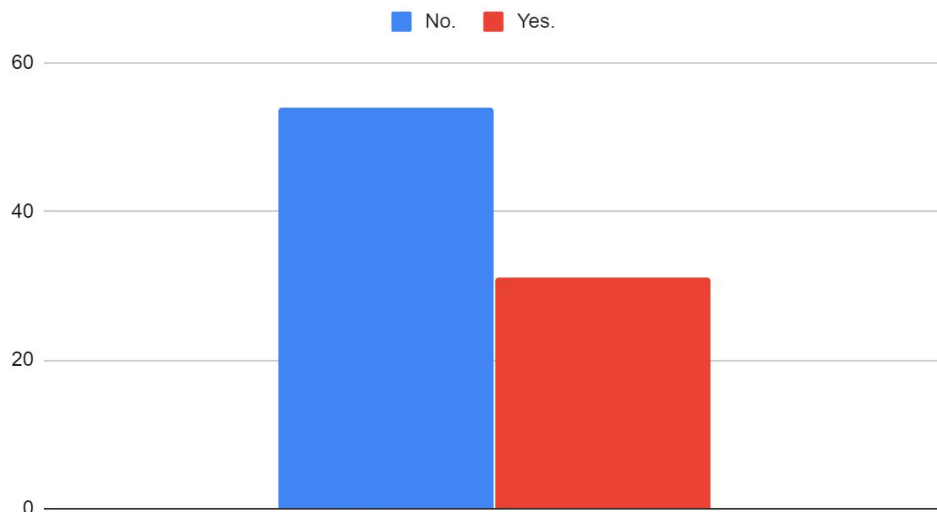


Appendix Two

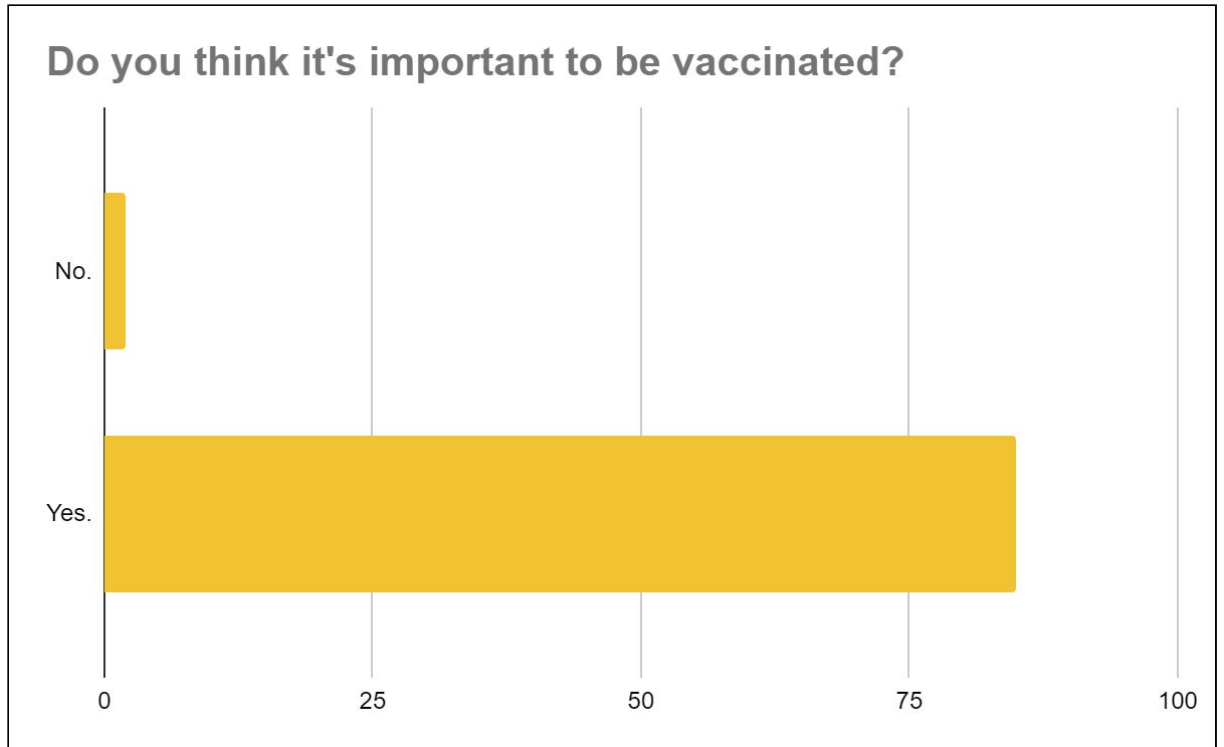
(Survey)

Here we present the different points of view of the students of the San Agustín secondary school, we created a questionnaire with some questions that help in the results of our monograph and the results were somewhat alarming because high school students do not know much or almost nothing about the anti-vaccine movement.

Have you ever heard about the anti-vaccine movement?



What do you know about the "anti-vaccines movement"?	
Anything.	41
(A wrong idea).	12
People against vaccines because they think it causes diseases/it's dangerous.	16
It's a group that thinks vaccines produce a placebo effect.	7
It was created by Andrew Wakefiel, a man who lied about vaccines.	5
A group of people that thinks it's a conspiracy.	6

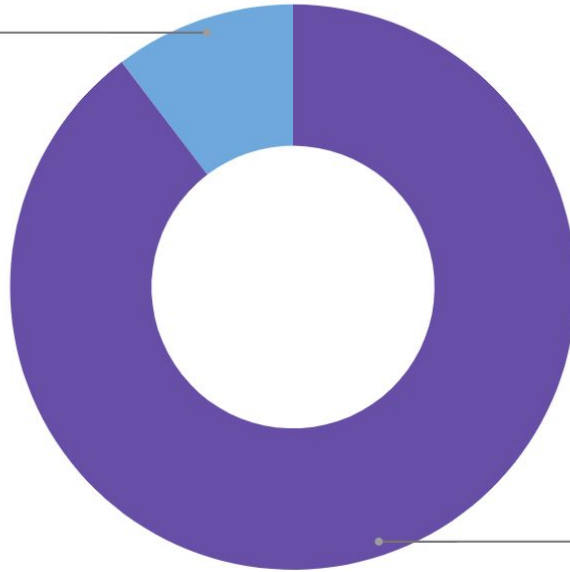


Why it's important being vaccinated, or why not?	
Because you can prevent diseases.	79
(A wrong idea).	3
I don't know.	5

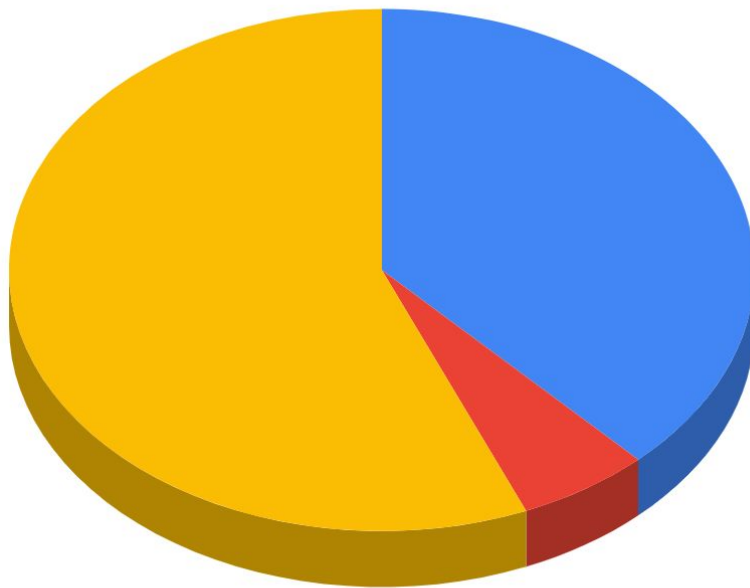


Do you think that when you get vaccinated, you can get autism?

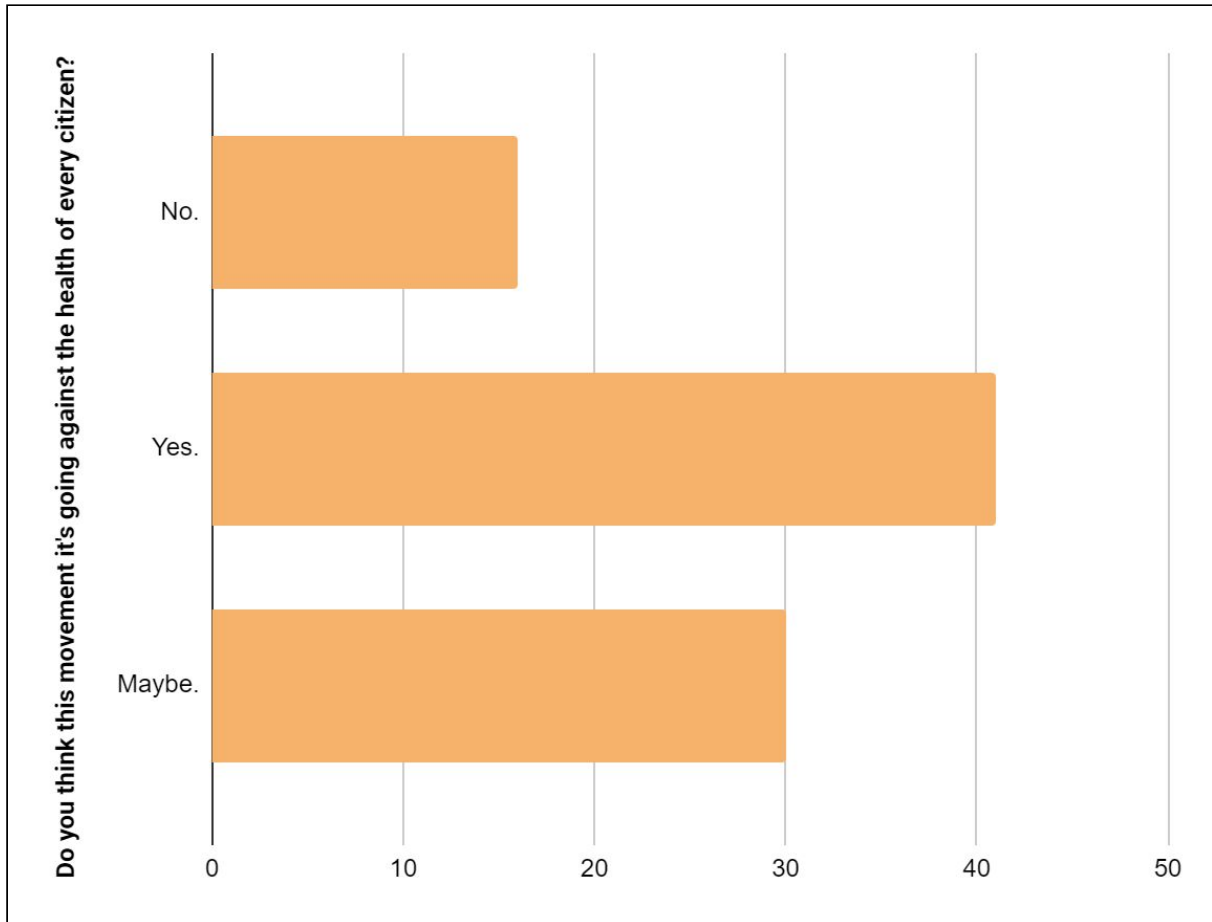
Yes.
10,3%



No.
89,7%



- No.
- Yes.
- I don't know who is him.



Why do you think this movement it's going against the citizen's health, or why not?	
I don't know.	32
(A wrong idea).	4
(Yes) Because it confuses the population.	8
(Yes) Because this illnesses can come back/people can die.	37
(No) Because it's it's decision of everybody.	6



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CONCLUSIONS

The anti-vaccine movement is a global problem, this means that it affects the entire society itself. Just because they are not well informed, parents think that their children can be affected instead of being protected by vaccines, they also put danger to the lives of their own children and other children in the community who have not been vaccinated. Today's parents should inform more since the health and well-being of their children is a serious problem, this is where the media comes in, as we know the use of the internet has become fundamental especially for consultations or curiosities that one has, therefore we should give it a better use and know that not all the information is true. What parents should do is consult a person who knows about this, be it a doctor or a specialist. If we analyze, we realize that mostly in undeveloped countries children are not vaccinated and this is because in these places there are different religions, customs, etc.

Also people are not well informed and therefore will believe everything they hears and in this way ignorance is born.



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