Sharon Wong
1054 Kaupaku Place
Honolulu, HI 96825
February 5, 2008

Representative Josh Green, M.D.
Chair, House Committee on Health
415 South Beretania Street
Honolulu, HI 96813

Representative John Mizuno
Vice-Chair, House Committee on Health
415 South Beretania Street
Honolulu, HI 96813

RE: IN STRONG SUPPORT OF HB2727, DYLAN'S LAW, RELATING TO HEALTH INSURANCE COVERAGE FOR AUTISM, HOUSE COMMITTEE ON HEALTH HEARING ON WEDNESDAY, FEBRUARY 6, 2008, 8:00 A.M., CONFERENCE ROOM 329

Dear Chair Green, Vice-Chair Mizuno, and Members of the House Health Committee:

I am in strong support of House Bill 2727, otherwise known as Dylan's Law, which mandates health insurance coverage for autism spectrum disorders.

My child has autism, and will have it for the rest of his life. Unbeknownst to me, my husband, and other relatives, as an infant and toddler, he displayed many of the symptoms of autism. He did not develop speech, he flapped his hands when excited, he would spin jar covers (like tops) for unusually long periods of time, he would walk on his toes, he would be terrified when hearing the vacuum cleaner, he preferred to eat 'white' food, he would get upset when the car stopped at a stop light, he could not sit still to be read to. He was diagnosed with autism at the age of three.

Many children with autism are at risk for a range of other medical conditions.
As an example, my son has also been diagnosed with attention deficit disorder, functional vision problems, central auditory processing disorder, sensory issues, speech/language problems, food allergies, skin rashes, and metals toxicity.

My son is now eleven and he has developed into a good-natured, well-behaved, well-mannered, talking boy with a pleasant personality. Any casual observer would not think that he has a disability. He plays with his classmates, talks to everyone, tells jokes, understands that other people have feelings and can say things to comfort them when needed.

He did not miraculously improve on his own. Because of my husband and my efforts in getting him the treatments he needed, with the help of qualified health professionals, and

through his own efforts, we all worked together to get him to where he is today. Many of the treatments were not covered by insurance, so we paid for them. Some of these treatments were: applied behavior analysis, speech therapy, vision therapy, neurofeedback therapy, sensory diets, modification of his diet to address his food allergies, and nutritional supplementation.

While we were fortunate to be able to pay for these treatments, our savings has been drained. There are other treatments that he needs, but we need to consider our financial status more carefully now. I know of other parents who simply cannot afford the treatments, or who have gone into debt to pay for these treatments. Clearly, this should not happen – treatments should be provided based on necessity, which will improve our children's ability to learn and become productive members of society. Otherwise, family members, the government, the taxpayers, and society will bear the burden of supporting these children when they grow to be adults, for the rest of their lives.

With the help of many qualified health professionals, my child has a great chance to become a contributing member of society; to take care of himself, and not be taken care of. Don't we want all of our children, including children with autism, to have this chance?

Thank you for the opportunity to address the needs of our children and youth adults with autism spectrum disorders.

Sincerely,

Sharon Wong
(via email)

Dr. and Mrs. William K. Wong Jr. M.D.
46-312C Haiku Rd.
Kaneohe, HI 96744
247-5956

LATE
Testimony

5 February 2008

Representative Josh Green, M.D.
Chair, House Committee on Health
Hawaii State Capitol, Room 327
415 South Beretania Street
Honolulu, Hawaii 96813

Representative John Mizuno
Vice-Chair, House Committee on Health
Hawaii State Capitol, Room 436
415 South Beretania Street
Honolulu, Hawaii 96813

Re: Support of Dylan's Law HB2727, Relating to Health Insurance Coverage for Autism Spectrum Disorders
House Committee on Health, February 6, 2008, 8 a.m., Room 329

Dear Chair Green, Vice-Chair Mizuno, and members of the House Health Committee:

We are writing as concerned parents and citizens to express support of House Bill 2727, otherwise known as Dylan's Law. This bill mandates health insurance coverage for autism spectrum disorders.

We are parents of a 4 year old son on the autism spectrum named Billy. Billy was diagnosed with autism by a Department of Health psychologist days before his third birthday. When he turned 3 he attended a DOE Special Education Preschool for 5 months. Unfortunately, we as parents, and our team of experts in the fields of psychology and autism, felt that the "Free Appropriate Public Education (FAPE) guaranteed to my son by federal IDEA law, was not appropriate for my son's unique learning needs. We therefore were forced to file for due process, took Billy out of the DOE school, and put him in a private preschool along with the Applied Behavior Analysis (ABA) therapy that we felt was appropriate for his disabling condition.

With the changes we have made to Billy's education and therapy, he has made an amazing improvement in one year. Here are some examples: Whereas before he could barely answer a simple question and spoke in terse, awkward 3-4 word phrases, now he is having conversations with us, speaking in sentences with over 10 words, and is able to express increasingly complex ideas. Whereas before the extent of his playing with toys was spinning the wheels of cars, now he uses them appropriately, makes the "zoom zoom" sounds, and sometimes even narrates what he is doing. What we am most excited and thrilled about is that he is now talking to and interacting with his peers in preschool.

We are optimistic that with continued intensive therapy in his formative years, Billy will eventually shed his diagnosis and become a fully independent, contributing member of society. Without such therapy, children with autism become lifelong dependents of their families, and the State. For each child affected by autism, the socioeconomic drain on public resources is immense.

These improvements were a direct result of the intense Applied Behavior Analysis (ABA) program that we implemented for Billy. However, because this type of therapy is time consuming, highly individualized, and must be implemented by trained therapists and consultants, we truly pay through the nose. Our costs range from $7000 to over $10,000 per month. Despite the exorbitant cost, it is all worthwhile to see our son understand and tell jokes, play appropriately with his toys, converse with us, and for us to see so many other skills emerging. We feel truly blessed that due to our present circumstances we are able to afford the therapy for now. However, it is still an enormous burden on our family. Any amount of financial help from insurance companies would help us immensely and would truly be appreciated.

Autism is a complex neurobiological disorder that currently affects 1 in 150 children, according to the Center for Disease Control. It is a medical diagnosis as defined in the DSM IV - Diagnostic and Statistical Manual of Mental Disorders Fourth Edition (ICD-8 code 299.0) which requires treatment services from trained medical professionals and a full-range of therapies. The therapies include speech therapy, occupational therapy, and intensive behavioral therapy, such as Applied Behavior Analysis (ABA), among others. With proper medical intervention and intensive therapies children with autism can improve to such an extent that they can enter mainstream classrooms unassisted. In our personal experience, such therapies are successful but expensive. Children with autism are have been denied coverage for necessary therapies by private health insurance companies. It is incredulous that such a serious medical disorder has been universally denied coverage by medical insurance carriers. Medical insurance carriers must be required to provide coverage for Autism therapy. Virtually all families of children with autism are deeply in debt as a result of the lack of insurance coverage for these necessary therapies. . Currently these costs are borne by families, and the Departments of Education and Health. With the epidemic increase in prevalence of this disease, the State will be facing a crisis with already strained finances and resources. In the end, the victims will be our children.

The cost of paying for the therapies out of pocket not only causes financial strain for the families, but it also causes heavy emotional distress. For many of these families, the stress is more than they can bear and many marriages end in divorce. In spite of the burdens of autism on the insurance companies, the government, the families, and society as a whole, the most important issue is the child. Dylan's Law is about all children with autism who deserve to have a better quality of life.

We urge you to pass Dylan's Law House Bill 2727 and make insurance coverage for autism a reality. The children with autism in Hawaii deserve to have the opportunity to thrive.

Sincerely,

Dr. and Mrs. William K. Wong, Jr. M.D.

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Teresa Chao Ocampo
215 N. King Street, Apt. 207
Honolulu, HI 96817

February 6, 2008

Representative Josh Green, Chair
Representative John Mizuno, Vice Chair
The House Committee on Health
State Capitol
415 South Beretania Street
Honolulu, HI 96813

LATE
stimony

Meeting on Wednesday, February 6, 2008, Conference Room 329 8:00am

RE: HB2727 RELATING TO AUTISM SPECTRUM DISORDERS

Dear Representatives Green and Mizuno and House Committee on Health:

I am writing in support of HB 2727 to have various services related to Autism covered by insurance providers in Hawaii. Currently, there are 17 states that require some insurance coverage for Autism related services.

According to the Autism Society of America, Autism is a complex neurological disorder that typically appears in the first three years of life. It affects the functioning of the brain and therefore impacts the normal development of the brain in the areas of social interaction and communication skills. Autism and its many variations are recognized in the American Psychiatric Association's Diagnostic & Statistical Manual of Mental Disorders (DSM-IV-TR). Therefore, Autism is treatable.

In February 2007, the Centers for Disease Control and Prevention had issued a report that concluded that the prevalence of Autism had risen to 1 out of 150 children in the United States and almost 1 in every 94 boys. This means that there may be as many as 1.5 million Americans today living with Autism. If you review the statistics from the Department of Education, Hawaii's Autism rates have steadily increased in parallel with the national average. Financial challenges for parents are magnified due to limited insurance coverage for therapies in the treatment of Autism. Hawaii's insurance companies do not even RECOGNIZE Autism as a disease or disorder.

Parents must often make difficult choices between their Autistic child and the needs of the rest of the family where they incur thousands and thousands of dollars of out of pocket expenses for therapies, drugs and various labs that are currently not covered by health insurance providers here in Hawaii. As a parent of an Autistic child, every day is a struggle.

Routine tasks that many people take for granted such as eating, brushing teeth, changing clothes, going to school and playing at the playground all take a toll on parents and family of Autistic children day to day. We have to teach our children how to understand pragmatic speech, how to read body language and how to understand inferences in social settings. We have to teach our children the need for emotions and what they mean. We have to teach our children not to panic when they get wet by a few drops of rain. We have to teach our children how to survive in a world that does not tolerate differences anymore. That's why we need this bill to pass. Our children need these services early in life to help them function in society independently as adults.

Granted there are some services provided by the Department of Education and the Department of Health. However, once a child reaches 3 years old and transitions into the DOE, he technically can no longer receive autism-related services from the DOH. As for the DOE, many of their providers such as psychologists are minimally trained in Autism and many are currently without a

Hawaii license to practice outside the DOE. Therefore, these psychologists would not be able to diagnose or provide any type of medical care to these children under this insurance bill.

Merits of this Bill are:

1) **The Inclusion of Applied Behavior Analysis.** It has been shown that children diagnosed between 0-3 years of age who receive intensive services using various forms of Applied Behavior Analysis have a much greater chance of integrating into the community socially and independently at an earlier age. Since the costs of these services can be overwhelming for those families who cannot afford such services, society will have to "pay" throughout the child's lifetime by providing basic services for this child throughout adulthood. An Autistic child has the greatest opportunity of successful integration into the community and school when he is identified early enough to receive intensive ABA services before his 8th birthday.

2) **"Rehabilitative Care" includes "Habilitative Care".** Currently insurance plans exclude Habilitative services such as speech. If the ability for speech is not LOST but rather ABSENT during the developmental stages of a child's life, then speech therapy is not covered. One of the first signs that lead parents to see their pediatrician is when their child fails to develop speech between 12 and 15 months. Many Autistic children have delayed speech due to conditions such as Apraxia which is a neurological breakdown between the brain and the muscles in the tongue, lips, cheeks, jaw and palate. Another speech condition that may be related is called Dysarthia which results from a damaged nervous system affecting the strength and control of muscles for speech and non-speech functions such as smiling. These conditions which would fall under Habilitative, if untreated, can have profound effects on the developmental and functional progress of Autistic children. With Speech Therapy included as a "Habilitative Service" in the diagnosis and treatment Autistic children, it will positively impact the lives of these children by assisting them to successfully integrate into society as independent individuals.

3) **This bill will allow qualified and experienced physicians, psychologists and nurse practitioners in the PRIVATE SECTOR to diagnose and treat these children.** It would benefit the children the most if parents have the option of seeing physicians, psychologists or certified nurse practitioners of their choice simply because of convenience or of an existing working relationship with these professionals. This matter of choice should not burden the DOE or the insurer any more than it does presently.

4) **The definitions as listed in this bill clearly describe the types of services to be provided and by whom.**

Insurance companies may argue that there will be a shift in the cost of autism related services to those private members who currently pay premiums. Despite the fact that there are organizations such as the DOE and DOH that currently provide autism related services, these groups do not provide the MEDICAL services also needed in the treatment of Autism. As we all know, these agencies have their OWN CURRENT challenges in providing these services to Autistic children such as a lack of providers experienced with Autistic children, providers with limited knowledge, limited availability of providers and too narrow a scope of services provided. Lastly, Autism is a NEUROLOGICAL DISORDER INVOLVING THE BRAIN. Therefore, it is a MEDICAL condition that should be RECOGNIZED by all insurers in Hawaii and treated as such.

Thank you for your serious consideration in this matter.

Hawaii license to practice outside the DOE. Therefore, these psychologists would not be able to diagnose or provide any type of medical care to these children under this insurance bill.

Merits of this Bill are:

1) **The Inclusion of Applied Behavior Analysis.** It has been shown that children diagnosed between 0-3 years of age who receive intensive services using various forms of Applied Behavior Analysis have a much greater chance of integrating into the community socially and independently at an earlier age. Since the costs of these services can be overwhelming for those families who cannot afford such services, society will have to "pay" throughout the child's lifetime by providing basic services for this child throughout adulthood. An Autistic child has the greatest opportunity of successful integration into the community and school when he is identified early enough to receive intensive ABA services before his 8th birthday.

2) **"Rehabilitative Care" includes "Habilitative Care".** Currently insurance plans exclude Habilitative services such as speech. If the ability for speech is not LOST but rather ABSENT during the developmental stages of a child's life, then speech therapy is not covered. One of the first signs that lead parents to see their pediatrician is when their child fails to develop speech between 12 and 15 months. Many Autistic children have delayed speech due to conditions such as Apraxia which is a neurological breakdown between the brain and the muscles in the tongue, lips, cheeks, jaw and palate. Another speech condition that may be related is called Dysarthia which results from a damaged nervous system affecting the strength and control of muscles for speech and non-speech functions such as smiling. These conditions which would fall under Habilitative, if untreated, can have profound effects on the developmental and functional progress of Autistic children. With Speech Therapy included as a "Habilitative Service" in the diagnosis and treatment Autistic children, it will positively impact the lives of these children by assisting them to successfully integrate into society as independent individuals.

3) **This bill will allow qualified and experienced physicians, psychologists and nurse practitioners in the PRIVATE SECTOR to diagnose and treat these children.** It would benefit the children the most if parents have the option of seeing physicians, psychologists or certified nurse practitioners of their choice simply because of convenience or of an existing working relationship with these professionals. This matter of choice should not burden the DOE or the insurer any more than it does presently.

4) **The definitions as listed in this bill clearly describe the types of services to be provided and by whom.**

Insurance companies may argue that there will be a shift in the cost of autism related services to those private members who currently pay premiums. Despite the fact that there are organizations such as the DOE and DOH that currently provide autism related services, these groups do not provide the MEDICAL services also needed in the treatment of Autism. As we all know, these agencies have their OWN CURRENT challenges in providing these services to Autistic children such as a lack of providers experienced with Autistic children, providers with limited knowledge, limited availability of providers and too narrow a scope of services provided. Lastly, Autism is a NEUROLOGICAL DISORDER INVOLVING THE BRAIN. Therefore, it is a MEDICAL condition that should be RECOGNIZED by all insurers in Hawaii and treated as such.

Thank you for your serious consideration in this matter.

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Sincerely,

Teresa Chao Ocampo
Parent of an Autistic child

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AUTISM SOCIETY OF HAWAI'I

P.O. BOX 2995

HONOLULU, HAWAI'I 96802

808 228-0122

VIA FAX 586-6051

February 6, 2008

Representative Dr. Josh Green
Chair, House Committee on Health
Hawaii State Capitol, Room 327
415 South Beretania Street
Honolulu, HI 96813

Representative John Mizuno
Vice Chair, House Committee on Health
Hawaii State Capitol, Room 436
415 South Beretania Street
Honolulu, HI 96813

Subject: In strong support of Dylan's Law HB2727, Relating to Health Insurance Coverage for Autism Spectrum Disorders
House Committee on Health, February 6, 2008, 8 a.m., Room 329

Dear Chair Green, Vice-Chair Mizuno, and members of the House Health Committee:

The Autism Society of Hawai'i offers its strong support for Dylan's Law HB 2727. This bill mandates health insurance coverage for autism spectrum disorders.
The Autism Society of Hawai'i is an affiliate chapter of the Autism Society of America. It members are composed of families who deal with living with the effects of autism spectrum disorders and the professionals and paraprofessionals who serve them. The Autism Society of Hawai'i will provide leadership in the field of autism spectrum disorders dedicated to supporting families who advocate on behalf of their children and are committed to reducing the consequences of autism through education, research, and advocacy.
First of all, thank you for considering this important need for the autism community. With autism growing at an epidemic pace and proportion and the health needs, research shows that these individuals require early intervention and intensive services. Currently, there is a great need to provide options and alternatives from the I.D.E.A. in order for children and students to access these important services in order to meet the unique health needs of children and their families dealing with autism spectrum disorders.

Autism is a complex neurobiological disorder that currently affects 1 in 150 children, according to the Center for Disease Control. This disorder affects boys four times more likely than girls. Autism impairs a person's ability to communicate and relate to others, and is often associated with repetitive behaviors, poor eye contact, and rigidity in routines. Children with autism often have co-occurring conditions, such as behavioral problems, speech disorders, depression, anxiety,

muscle or joint problems, ear infections, vision and hearing problems, and allergies. The wide range of co-occurring problems leads to their need for services from trained medical professionals and for a full-range of therapies. The therapies include speech therapy, occupational therapy, and intensive behavioral therapy, such as Applied Behavior Analysis (ABA), among others. With proper medical intervention and intensive therapies children with autism can improve to such an extent that they can enter mainstream classrooms unassisted.

Unfortunately, children with autism are often denied coverage for necessary therapies by private health insurance companies. One important therapy denied by insurers is Applied Behavior Analysis (ABA). ABA has a decades-long record of efficacy. It is a data-based intervention for autism that has over forty years of research behind it. In a 1987 study by Ivar Lovaas, the children who underwent early intensive ABA therapy achieved higher educational placement and increased IQ levels than those who did not. ABA is recognized by The U.S. Surgeon General's 2001 Report on Mental Health as the treatment that is widely accepted as being effective for autism, and the National Institute of Child Health and Human Development acknowledges that Applied Behavior Analysis is an effective treatment for autism. Although ABA is the single intervention most often sought by parents of children with autism, insurers frequently deny it as a benefit. As a result, families are often forced to pay for these costly services out of pocket.

Too many families of children with autism are deeply in debt as a result of the lack of insurance coverage for these necessary therapies. However, the cost of paying for the therapies out of pocket not only causes financial strain for the families, but it also causes heavy emotional distress. For many of these families, the stress is more than they can bear and many of the marriages end in divorce. But in spite of the burdens of autism on the insurance companies, the government, the families, and even on society as a whole, the most important point in this issue is the CHILD. Dylan's Law is about all children with autism who deserve to have a better quality of life.

The Autism Society of Hawai'i appreciates the opportunity to submit a letter of support for Dylan's Law House Bill 2727 and make insurance coverage for autism a reality. We look forward to hearing that this bill is passed in the House Committee on Health today.
The children with autism in Hawaii deserve to have the opportunity to thrive.

Sincerely,

Naomi Grossman
Autism Society of Hawai'i, president

TESTIMONY IN SUPPORT OF H.B. 2727
RELATING TO HEALTH INSURANCE

Submitted to the Committee on Health
Representative Josh Green, Chair

By
Richard Cox, Kapolei

Chair Green:

My wife and I are the parents of a child with autism. We support this bill and strongly urge its passage.

Only in the past 20 years has there been a recognition that autism is a treatable medical condition and that those with autism have the ability, as well as the right, to take their place in society, to make their unique contributions just as the rest of us do. Unfortunately autism is accompanied by a host of other medical problems as well, including motor skills impairments, vision impairments, gastrointestinal problems, etc. As a physician, you know the costs of treating children with autism.

The challenges and costs of helping those with autism are significant and borne primarily by their families. Because autism has not traditionally been seen as a medical condition, health insurance has not been available for its diagnosis and treatment. Thus, despite the overwhelming evidence that early intervention makes significant and permanent improvement in the health of children with autism, because insurance is not usually available to them, parents of children with autism must pay for the intensive (and expensive) treatments themselves. Many parents are then faced with the painful choice of incurring costs they can little afford or denying their children the early treatments that could mean the difference between a happy and productive life or a lifetime of institutional assistance.

Further, beyond the financial costs, there are significant familial and societal costs. Although there are conflicting reports about the rate of divorce among parents of children with autism, a 2004 study in Britain found that children with autism are raised by a single parent 70% more often than the norm. Another study in 2004 found that more than 50% of mothers of children with autism suffered significant psychological distress, to the point of requiring medication or psychotherapy.

Please help the parents and families of children with autism in Hawaii have a little less to cope with by requiring adequate insurance coverage for autism spectrum disorders. Please help ensure that children with autism are given the opportunity to receive the treatments that will help give them the health and happiness that the rest of us enjoy.

Please pass HB 2727.

Rep. Josh Green, M.D., Chair
Rep. John Mizuno, Vice Chair
Committee on Health

Rep. Maile S. L. Shimabukuro, Chair
Rep. Karl Rhoads, Vice Chair
Committee on Human Services & Housing

LATE
Testimony

Sherri Henriques
1834 St. Louis Dr.
Honolulu, HI 96816
Ph. 735-9766

Wednesday, February 6, 2008
HB2727, 8:00 am, Rm. 329

In Support of HB2727, Relating to Health Insurance for Autism Spectrum Disorders

I am a mother of a child with Autism. I am testifying in favor of HB2727. Thanks to the many different therapies and interventions such as, Applied Behavior Analysis (ABA) and Speech, our 4-1/2 yr. old son is recovering from autism. However, the financial burden of these effective therapies and interventions is overwhelming and we need the assistance of insurance companies.

I strongly urge you to vote "YES" to HB 2727.

Thank you for this opportunity to testify.

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mizuno1-Edgar

From: Amy Wiech [Amy@autismbehaviorconsulting.com]
Sent: Tuesday, February 05, 2008 10:50 PM
To: HLTtestimony
Cc: amy@autismbehaviorconsulting.com
Subject: Dylan's Law~HB2727
Importance: High

Amy Wiech, M.Ed., BCBA
Board Certified Behavior Analyst
PO BOX 1162
Waialua, Hawaii 96791-1162
808-277-7736

2/5/2008

Representative Josh Green, M.D.
Chair, House Committee on Health
Hawaii State Capitol, Room 327
415 South Beretania Street
Honolulu, Hawaii 96813

Representative John Mizuno
Vice-Chair, House Committee on Health
Hawaii State Capitol, Room 436
415 South Beretania Street
Honolulu, Hawaii 96813

Re: In strong support of Dylan's Law HB2727, Relating to Health Insurance Coverage for Autism Spectrum Disorders
House Committee on Health, February 6, 2008, 8 a.m., Room 329

Dear Chair Green, Vice-Chair Mizuno, and members of the House Health Committee:

I am writing to express my strong support of House Bill 2727, otherwise known as Dylan's Law. This bill mandates health insurance coverage for autism spectrum disorders.
I am a Board Certified Behavior Analyst (BCBA), with a Master's Degree in Special Education. I am currently completing my Ph.D. in Education at University of Hawaii. I have worked with many children in Hawaii using Applied Behavior Analytic (ABA) procedures of teaching new skills and language for the past 13 years since I first moved to this Aloha State as a Special Education Teacher. I have witnessed first hand the sacrifices that parents make in order to fund the necessary ABA programs for their children with Autism.

Autism is a complex neurobiological disorder that currently affects 1 in 150 children, according to the Center for Disease Control. This disorder affects boys four times more likely than girls. Autism impairs a person's ability to communicate and relate to others, and is often associated with repetitive behaviors, poor eye contact, and rigidity in routines. Children with autism often

have co-occurring conditions, such as behavioral problems, speech disorders, depression, anxiety, muscle or joint problems, ear infections, vision and hearing problems, and allergies. The wide range of co-occurring problems leads to their need for services from trained medical professionals and for a full-range of therapies. The therapies include speech therapy, occupational therapy, and intensive behavioral therapy, such as Applied Behavior Analysis (ABA), among others. With proper medical intervention and intensive therapies children with autism can improve to such an extent that they can enter mainstream classrooms unassisted.

Unfortunately, children with autism are often denied coverage for necessary therapies by private health insurance companies, although it is a medical disorder. One important therapy denied by insurers is Applied Behavior Analysis (ABA). ABA has a decades-long record of efficacy. It is a data-based intervention for autism that has over forty years of research behind it. In a 1987 study by Ivar Lovaas, the children who underwent early intensive ABA therapy achieved higher educational placement and increased IQ levels than those who did not. ABA is recognized by The U.S. Surgeon General's 2001 Report on Mental Health as the treatment that is widely accepted as being effective for autism, and the National Institute of Child Health and Human Development acknowledges that Applied Behavior Analysis is an effective treatment for autism. Although ABA is the single intervention most often sought by parents of children with autism, insurers frequently deny it as a benefit. As a result, families are often forced to pay for these costly services out of pocket. I have known families to re-mortgage their homes, go into bankruptcy, and accrue hundreds of thousands of dollars in debt in order to provide this effective treatment. The school system is not able to maintain the level of expertise that these kids need in the majority of situations. Due to it being a medical disorder, it should be covered by medical insurance.

There have been many cost benefit analyses of ABA conducted to compare the costs associated with providing this much needed plethora of interventions, to the costs associated with caring for an individual with Autism over the course of their life. The results are compelling for me as a taxpayer to provide these services NOW , as early as possible for children diagnosed with Autism. These children can get better, and improve their ability to be a contributing member of society. I have also participated in the recovery of several children who no longer meet the criteria for Autism and do not require any more intervention, and who are able to maintain their skills and learn with their typically developing peers in mainstream classrooms without supports. I have emailed these articles in the subsequent emails for your review. The lack of funding for ABA in Early Childhood, up until age 16 is EGREGIOUS and the impact it has on society is unforgivable. Please read these and consider the impact on future society as well as the impending tax burden.

Too many families of children with autism are deeply in debt as a result of the lack of insurance coverage for these necessary therapies. However, the cost of paying for the therapies out of pocket not only causes financial strain for the families, but it also causes heavy emotional distress. For many of these families, the stress is more than they can bear and many of the marriages end in divorce. But in spite of the burdens of autism on the insurance companies, the government, the families, and even on society as a whole, the most important point in this issue is the CHILD. Dylan's Law is about all children with autism who deserve to have a better quality of life.

I urge you to pass Dylan's Law House Bill 2727 and make insurance coverage for autism a reality. The children with autism in Hawaii deserve to have the opportunity to thrive. Many other states on the mainland are already have laws in place for Insurance Coverage for Autism.

Please help make this come to fruition, and help save a future generation of children with Autism.

Mahalo for your consideration.

Sincerely,

Amy Wiech

Amy Wiech, M.Ed., BCBA

Board Certified Behavior Analyst
Autism Behavior Consulting Group, Inc.
~Educational and Behavior Consulting Services~
website: www.AutismBehaviorConsulting.com
email: info@AutismBehaviorConsulting.com
(808) 277-7736
1 +(808) 443-0333 fax

"In God We Trust - All Others Bring Data!"
- W. Edwards Deming

If you want to be happy for an hour, take a nap.
If you want to be happy for a day, go fishing.
If you want to be happy for a month, go on a honeymoon.
If you want to be happy for a year, inherit a fortune.
If you want to be happy for a lifetime, teach children with disabilities.

Adapted from a Chinese Proverb-Unknown Author

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February 5, 2008

Representative Josh Green, M.D.
Chair, House Committee on Health
Hawaii State Capitol, Room 327
415 South Beretania Street
Honolulu, Hawaii 96813

Representative John Mizuno
Vice-Chair, House Committee on Health
Hawaii State Capitol, Room 436
415 South Beretania Street
Honolulu, Hawaii 96813

Re: Dylan's Law HB2727, Relating to Health Insurance Coverage for Autism Spectrum Disorders
House Committee on Health, February 6, 2008, 8 a.m., Room 329

Dear Chair Green, Vice-Chair Mizuno, and members of the House Health Committee:

I am writing to express my strong support of House Bill 2727, known as Dylan's Law. This bill mandates health insurance coverage for autism spectrum disorders.

Autism is a complex neurobiological disorder that currently affects 1 in 150 children, according to the Center for Disease Control. Autism impairs a person's ability to communicate and relate to others, and is often associated with repetitive behaviors, poor eye contact, and rigidity in routines. Children with autism often have co-occurring conditions, such as behavioral problems, speech disorders, depression, anxiety, muscle or joint problems, ear infections, vision and hearing problems, and allergies. The wide range of co-occurring problems leads to their need for services from trained medical professionals and for a full-range of therapies. The therapies include speech therapy, occupational therapy, and intensive behavioral therapy, such as Applied Behavior Analysis (ABA), among others. With proper medical intervention and intensive therapies children with autism can improve to such an extent that they can enter mainstream classrooms unassisted. Some even recover to the point of being indistinguishable.

Without intensive intervention; these children do not improve. They become more difficult to manage as they get older, and in the end will need a lifetime of managed care.

Currently a great number of children with autism are denied coverage for necessary therapies by private health insurance companies especially Applied Behavior Analysis (ABA). ABA is recognized by The U.S. Surgeon General's 2001 Report on Mental Health as the treatment that is widely accepted as being effective for autism, and the National Institute of Child Health and Human Development acknowledges that Applied Behavior Analysis is an effective treatment for autism. ABA is the single intervention most often sought by parents of children with autism, because of its peer reviewed research. On the otherhand, insurers frequently deny it as a benefit leaving families no choice but to pay for the services themselves.

I currently do not have retirement, or savings. I do not have resources for major medical. If something were to happen to me right now? I simply do not know how I am going to pay for it. A constant juggle to find a way to sustain my daughter's ABA program, and biomedical programs. The financial strain has caused heavy emotional distress. It has affected my performance at work. It is difficult to concentrate, because of the continued anxiety and nonstop stress. Currently 80% of families with Autism end in divorce.

Dylan's Law is about all children with autism who deserve to have a better quality of life instead of a lifetime of managed care. Please pass Dylan's Law House Bill 2727 and make insurance coverage for autism a reality The children with autism in Hawaii deserve to have the opportunity to thrive, get better, and even recover.

Thank you for your consideration.

Sincerely,

Deborah Tasato-Kodama

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Ex. C to Affidavit of Douglas G. Hildebrand dataed March 23, 2000

HB 2727

3165

COLUMBIA PACIFIC CONSULTING

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By hand

March 17, 2000
Our file: 215199
Your file 8777-96618

This is Exhibit "C" referred to in the affidavit of Douglas G. Hildebrand sworn before me, at Vancouver, BC this 23rd day of March 2000
A COMMISSIONER FOR TAKING AFFIDAVITS FOR BRITISH COLUMBIA

Harper Grey Easton
Barristers and Solicitors
3100 - 650 West Georgia St.
P.O. Box 11504
Vancouver , B.C.
V6B 4P7

Attention of Ms. Birgitta von Krosigk

Dear Sirs/Mesdames:

Re: Cost Benefit Analysis of Lovaas Treatment

Further to our preliminary report of December 7, 1999, "Cost-Benefit Analysis of Lovaas Treatment for Autism and Autism Spectrum Disorder (ASD)", we respond to the critique of our report attached to the Affidavit of Ms. Carolyn Green (February 2000).

The critique is entitled "Critical Appraisal of Submitted Cost-Benefit Models of 'Lovaas' Early Intensive Behavioural Intervention for Autism" (February, 2000) and is co-authored by Ms. Carolyn Green, Dr. Ken Bassett and Dr. Arminée Kazanjian, all of the B.C. Office of Health Technology Assessment (BCOHTA), University of British Columbia. Hereinafter we refer to the critique as Green et al for identification purposes.

We commence our reply with general comments, followed by specific comments on each section of the critique in chronological order (i.e., starting at page 1 through to page 18).

I. General Comments in Reply

1. As economists, we are in no position to comment on the medical/health effectiveness of Lovaas Treatment per se – we leave that issue to the medical specialists. Our cost-benefit analysis (CBA) does, however, explore a wide

range in effectiveness outcomes through sensitivity analysis. Our sensitivity testing was deliberately skewed towards the "downside" (i.e., scenarios which reduced net benefits relative to "most likely" or base case assumptions) in order to address the "robustness" of results.

2. Green et al maintain that our range in effectiveness assumptions should have been extended even further in the less favourable direction. For example, Green et al suggest that some proportion of children with autism should be assumed normal "without Lovaas", and that greater-than-10% of children "with Lovaas" should be assumed very dependent.[1] Our computer-based CBA model can be easily applied to explore even less favourable effectiveness assumptions. The suggestion by Green et al of zero difference in effectiveness between the "with Lovaas" and "without Lovaas" is, however, extreme. The result of such a scenario is self-evident, but the effectiveness assumption is contrary to the Jacobsen et al and Lovaas research which we were directed to assume within a British Columbia context.

3. Our cost assumptions were developed largely from review of material provided by the provincial government and by counsel. Variation in cost assumptions was also explored in sensitivity testing and we welcome any suggestions regarding alternate cost assumptions. We note that Green et al did not provide any comments on specific cost levels to assume.

4. To assist reviewers of our preliminary CBA, we will provide under separate letter two items: (1) a description of cost information from various sources which can be compared to our cost assumptions and which therefore provides context; and (2) CBA results for alternate effectiveness scenarios which reflect Green et al's comments.

5. We agree with Green et al that Drummond et al provide an excellent framework for economic evaluation techniques. As indicated below, we basically find Drummond et al to be supportive of our analysis, as distinct from the misinterpretations provided by Green et al.

II. Executive Summary Section (pages 1-2)

1. Green et al suggest the effectiveness assumptions are skewed in favour of Lovaas treatment. As Green et al appear to substantially dispute the

[1] / *Green et al indicate at page 1 that our CBA assumed an effectiveness range of 40% to 80% for the "very dependent" state without Lovaas treatment. This is incorrect. The 40% to 80% range pertained to the "semi-dependent" state without Lovaas treatment. The range for the "very dependent" state without Lovaas treatment was 20% to 60%.*

effectiveness of Lovaas treatment, this comment is to be expected. Effectiveness of treatment is a matter for medical/health specialists.

2. Green et al are critical of the cost assumptions and suggest costs should be based on actual measurements of functioning autism treatment programs. We note, however, that there already exists extensive cost information related to special needs individuals (including autistic persons) in British Columbia (moderately dependent, heavily dependent) in terms of their health, education and residential care requirements.

III. Section One-Introduction (Pages 3-5)

1.0 Economic Modelling Bias

1.1 We agree with the comments about models, potential for bias and the excerpt from Sheldon. Clinical trials are required, for example, prior to approval and commercialisation of a new drug treatment. The purpose of the Lovaas CBA (preliminary report) is to explore the treatment's potential economic merit vis à vis the existing approach to the disorder. The preliminary CBA report strikes us as appropriate within such a context.

2.0 Appropriateness of CBA Model

2.1 It is true that a cost-benefit study attempts to quantify in monetary terms the costs and benefits associated with each alternative. As Drummond et al outline in Chapter 7, the benefits of a health treatment option typically include the following:

(a) future health care costs avoided (or saved);
(b) increased productive output due to improved health status;
(c) intangible benefits which are the value of improved health per se to the individual consumer of the health care option.

2.2 Our CBA study quantified in monetary terms both cost saving (a) and wage income (b) benefits. This approach is consistent with Drummond et al's description of the Human Capital Approach (Section 7.2.1). Our method is also conservative in that no attempt was made to monetize intangible benefits of improved health (c), which, of course, would have increased the net benefits of Lovaas treatment in each scenario examined. Our decision not to monetize intangible benefits of improved health relates to the potential for double counting with (a) and (b), which Drummond et al discusses in Section 7.3. Hence our CBA restricts the monetary measure of willingness-to-pay (WTP) benefits to avoided costs and increased income productivity. Given

the double counting issue just noted and the very contentious issue of WTP approaches to monetizing intangible benefits of improved health (contingent valuation approach), our approach strikes us as appropriate in the context.[2]

2.3 Drummond et al also distinguish the typical assessment in which the costs and health benefits of the proposed option both increase, versus the atypical assessment (dominant case) in which costs of the proposed option are lower and health benefits increase (win-win). At page 142, Drummond et al say it is unnecessary to quantify health benefits in the dominant (win-win) case, for obvious reasons. Our CBA of Lovaas treatment was a dominant case – i.e., costs were lower and health benefits greater than the "no Lovaas" approach.

3.0 B.C. Government's Benefit-Cost Analysis Guidelines

3.1 Geen et al's comments on the B.C. Government's CBA guidelines are misplaced. The B.C. guidelines on CBA are consistent with Drummond et al's discussion on CBA. The B.C. Government's guidelines are reflective of guidelines published by the federal government and international lending institutions. Whilst the guidelines are not specifically targeted to health care, the concepts are generally accepted by economists.

IV. Sections Two-Three: Appraisal Methodology and Results (pages 6-11)

1.0 Appraisal Checklist

1.1 We have no difficulty with this 10-point checklist.

2.0 Well-Defined Question Posed? (#1)

2.1 We were asked to address a very specific question in our CBA: the costs and benefits of Lovaas treatment versus no Lovaas treatment. The no Lovaas treatment case was, of course, intended to reflect the *status quo* (or existing) approach to the disorder. We were not asked to address a range of other alternatives. The fact that other alternatives were not addressed does not invalidate the CBA methodology or results.

2.2 Green et al suggest alternatives should be compared to the "do nothing" option. This is appropriate when the "do nothing" option is viable (e.g., in a case evaluating alternate drug treatments where the consumer can choose the

[2] / *Another conservative feature of our CBA relates to benefit (b) increased productive output. We restricted our monetized benefit to wage earnings. As Drummond et al point out at page 210, a monetized benefit could be added to reflect increased productivity of household services. We frequently monetize the value of household services activity in serious personal injury cases along the lines suggested by Drummond et al (e.g., hourly replacement cost x number of hours of productive household work). In our CBA, however, we have not included the value of increased productive household work.*

"do nothing" option, i.e., it is feasible). In the case of autism, statutory or institutional mitigation comes into play. The "do nothing" case assumes that our society is prepared to "do nothing" for significantly handicapped individuals. Our comparative case for Lovaas treatment is the status quo scenario (without Lovaas) which involves the social costs of dealing with handicapped individuals. This approach appears to satisfy the intent of Drummond et al's references to "do nothing" and status quo in their Chapter 2.

3.0 Competing Alternatives (#2)

3.1 Green et al are critical of the lack of detail underlying the service requirements and costs of the two options addressed. Further detail will be provided under separate letter.

3.2 Green et al repeat the "textbook" need for the "do nothing" case as a benchmark. See response at 2.2.

4.0 Effectiveness Established? (#3)

4.1 Our CBA addressed a broad range of possible effectiveness outcomes for the "with Lovaas" and status quo cases. We also indicated that our base case (most likely) assumptions were drawn from Jacobsen et al and Lovaas research. Beyond that, we leave it to the medical/health specialists to address effectiveness issues.

5.0 All Costs/Consequences Identified (#4)

5.1 Further detail is requested and will be provided.

6.0 Costs/Consequences Measured Accurately in Physical Units (#5)

6.1 Issues raised concerning cost reliability, cost detail and range of effectiveness assumptions have been dealt with above.

6.2 Green et al suggest costs and consequences should be integrated into the measure of cost per quality-adjusted life years (QUALs). In essence, they suggest an alternate methodology to CBA be applied, namely cost-utility analysis (CUA) which is a variant of cost-effectiveness analysis (CEA). Under CUA/CEA methods, the consequences (health benefits) of a treatment option are not expressed in monetary terms, but are dealt with in physical units such as QUALs. The cost per QUALs are computed for each option and compared to establish the cost per QUALs gained.

6.3 We agree with Drummond et al and Green et al that CUA and CEA analyses can be useful and complementary to CBA in evaluating project options.

However, in the context of our evaluation, calculating the cost per QUAL has the following limitations:

- As Drummond et al say (see page 142), there is no need to bother calculating QUALs if it is a dominant assessment (i.e., lower cost and more effective – win/win case) such as our assessment. Calculation of QUALs in this context simply makes the dominant option even more attractive.
- Calculation of QUALs is obviously much more relevant to evaluating treatment options involving differences in life expectancy; in our assessment, life expectancy is assumed to be the same for both options.

6.4 As an exercise and for purposes of illustration only, we have calculated the cost per QUALs following the method set out by Drummond et al in Chapter 6. We re-express the discounted cost of "without" and "with" Lovaas treatment (excluding wage income) on a cost per QUALs basis. The assumptions are as follows:

- Weights for normal, semi-dependent and very dependent states are set at 1.0, 0.85 and 0.65 respectively; these are arbitrary weights, but generally reflect the data in Table 6.7 of Drummond et al;
- The expected weight for the "with" and "without" Lovaas treatment cases are calculated at 0.89 and 0.75 respectively assuming our Base Case effectiveness outcomes;
- From Tables 13 and 14 of our report, the discounted value of life-years (unadjusted for quality) is about 26.3 at 3.5% real assuming an 80/20 incidence rate for males/females;
- discounted QUALs are calculated, therefore, at about 23.4 and 19.7 for the "with" and "without" Lovaas treatment cases respectively;
- on this basis the cost per QUALs gained is estimated as follows (per child):

Scenario	Discounted Cost	Discounted Cost per QUALs
(a) Without Lovaas	$2.4 million	$121,800
(b) With Lovaas	$1.4 million	$ 59,800
(c) Cost Saving	$1.0 million	$ 62,000 gained
(d) Ratio (a) to (b)	1.714	2.037

The above illustration indicates that inclusion of health benefits as measured by QUALs increases the relative merit of Lovaas treatment. This is evident from the benefit/cost ratio (ratio of avoided cost to cost) which increases from about 1.7 (unadjusted for life quality) to 2.0 (adjusted for life quality). In conclusion on this point, we note that there is contention amongst economists as to quantification of

QUALs (i.e., just as there is in valuing an individual's health benefits in monetary terms) as noted by Drummond et al in Chapter 6.

7.0 Costs/Consequences Valued Credibly (#6)

7.1 Issues already addressed.

8.0 Costs/Consequences Adjusted for Differential Timing (#7)

8.1 No apparent disagreement on discounting.

9.0 Incremental Analysis Done? (#8)

9.1 Issues already addressed.

10.0 Allowance Made for Uncertainty (#9)

10.1 Issues already addressed.

11.0 Include All Issues of Concern (#10)

11.1 Our CBA was a focussed assessment. Clearly there are issues of concern for many stakeholders that go beyond this narrowly focussed analysis. This does not, however, invalidate the study's findings.

V. Summary and Conclusions (pages 17-18)

The points made in summary and conclusion have already been addressed. As stated above, alternate effectiveness assumptions can be made and CBA results efficiently calculated with our computerised model. Further detail on costs can be provided, and CBA results can be generated with alternate cost assumptions as well. Other criticisms advanced by Green et al stem from their literal, textbook interpretations of Drummond et al, which, we have pointed out, have frequently been misinterpretations.

This concludes our reply.

Yours very truly,

Douglas G. Hildebrand
Director

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Delivered by Hand

March 20, 2000

This is Exhibit "D" referred to in the affidavit of Douglas G. Hildebrand sworn before me, at Vancouver BC this 23rd day of March 2000
A COMMISSIONER FOR TAKING AFFIDAVITS FOR BRITISH COLUMBIA

Our File: 215199
Your File: 8777-96618

Harper Grey Easton
Barristers and Solicitors
3100 – 650 West Georgia St.
P. O. Box 11504
Vancouver BC V6B 4P7

Attention of Ms. Birgitta von Krosigk

Dear Sirs/Mesdames:

Re: Cost Benefit Analysis of Lovaas Treatment

Further to our letter to you dated March 17, 2000, we respond to issues in Green et al's (February 2000) critique which we did not address in the earlier letter, namely, (1) cost information and (2) CBA results for alternative effectiveness scenarios which reflect Green et al's comment.

1.0 Description of Cost Information

In Sections 2.2 and 2.3 of our preliminary report, we briefly introduced the broad cost categories and mentioned principal sources of data used in the CBA. In the attached Data Appendix, we provide some further information with regard to cost derivation and data sources.

As indicated on Page 6 of our preliminary report, except for Lovaas early intervention and costs for Outcome 1 in the "with" treatment scenario, service costs for Outcome 2 are assumed to be 70% of those for Outcome 3. Hence, our descriptions in the Data Appendix focus on the costs for Outcome 3 unless otherwise noted.

2.0 CBA Results for Alternative Effectiveness Scenarios Based on Green et al's Comments

Green et al maintain that our range in effectiveness assumptions should have been extended further in the less favourable direction. For example, Green et al suggest that greater-than-10% of children "with Lovaas" should be assumed very dependent and that some proportion of children with autism should be assumed normal "without Lovaas". As indicated in our letter of March 17, 2000, as economists, we are not in a position to comment on the effectiveness of Lovaas treatment. In our preliminary analysis, we applied a computer model to explore the most likely scenarios based on Jacobson (1996)[1]. Our model can certainly be used to investigate any other possible scenarios, such as those suggested by Green et al. Examining these alternative scenarios, however, does not reflect our opinion with regard to the likelihood of their occurrence, an issue which can only be addressed by medical and health specialists.

In this section, we explore the impact on net benefits from Lovaas treatment by considering various alternative effectiveness scenarios. To achieve this, we take a three-step approach:

> Step 1: All else equal (to what we assumed in the preliminary report), we increase the proportion of children "with" Lovaas treatment but remain very dependent;
>
> Step 2: All else equal, we increase the proportion of children "without" Lovaas treatment but achieve normal functioning;
>
> Step 3: We <u>simultaneously</u> increase both the proportion of children "with" treatment but remain very dependent and the proportion of children "without" Lovaas treatment but achieve normal functioning.

Before we conduct step 1, we need to make some supplementary cost assumptions to facilitate our analysis.

➢ <u>Cost Assumptions for Children "Without" Lovass Achieving Normal Functioning</u>

On Page 9 of Green et al's critique, it was pointed out that "as many as 20% of children labelled 'autistic' achieved education and employment without the significant public expenditures that this model [our CBA model] attributes to all children not receiving Lovaas treatment". Our supplementary cost assumptions for the "without" treatment

[1] John W. Jacobson et al. *Financial Cost and Benefits of Intensive Early Intervention for Young Children with Autism – Pennsylvania Model Achieving Cost Savings.*

scenario are provided in Table 2A, attached. The difference between Table 2A and Table 2 of our preliminary report is that cost assumptions for Outcome 1 (Normal) have been added in Table 2A.

As no substantial expenditures in education and adult care are expected for children "without" treatment who achieve normal functioning, we assume costs incurred by children achieving normal functioning are the same "with" or "without" Lovaas treatment beyond age 6. From age 3 to age 6, costs incurred by children achieving normal functioning "without" treatment are assumed to be the same as costs incurred by children "without" treatment who belong to the semi-dependent category.

Table 3A, attached, provides a revised comparison of annual costs for "with" and "without" Lovaas treatment by age range and outcome. Although weights for each outcome in Table 3A are the same as in the Base Case of our preliminary report, expected annual cost savings can be estimated by assuming any specific weight for each outcome (as illustrated in Tables 3B and 3C, which will be discussed later in Section 2.2).

➢ Effectiveness Assumptions

In Section 3.2 of our preliminary report, we carried out a series of sensitivity analyses, the first of which was "Cost Savings of Lovaas Treatment by Outcome Distributions" (Table 7 of preliminary report). Table 7 calculated the cost savings (benefits) of Lovaas treatment by changes in the outcome distribution for the "with" Lovaas treatment scenario, the "without" Lovaas treatment scenarios and both scenarios simultaneously.

Variations in the "with" treatment outcomes were assumed as follows in our previous report:

(i) 10% of children "with" treatment will remain very dependent;

(ii) 20% - 60% achieve normal functioning;

(iii) (i) and (ii) imply that 30% - 70% of children are assumed to be semi-dependent.

Variations in the "without" treatment outcomes were assumed as follows in Table 7 of the preliminary report:

(a) 0% of children "without" treatment will achieve normal functioning;

(b) 40% - 80% achieve semi-dependent;

(c) (a) and (b) imply that 20% - 60% of children are assumed to remain very dependent.

In the following, we vary these assumptions step by step to explore the impact on our CBA results. Our sensitivity testing in the downward (less favourable) direction extends to the point of zero difference in effectiveness between the "with" and "without" scenarios.

2.1 Increasing the proportion of "Very Dependent" under "With" Lovaas

Green et al suggest that our assumption that only 10% of children "with" treatment remain very dependent (assumption (i) above) is overly optimistic. In Tables 7A and 7B, attached, we re-run the model allowing a higher proportion of children "with" treatment in the very dependent category.

Table 7A: Cost Savings of Lovaas Treatment By Outcome Distribution where **20%** of children "with" treatment are assumed to remain very dependent; detailed assumptions are listed in the table below:

Outcome	"With" Lovaas	"Without" Lovaas
Normal	20% - 60%	0%
Semi-dependent	20% - 60%	40% - 80%
Very Dependent	**20%**	20% - 60%

Table 7 of our preliminary CBA report indicated a net benefit of Lovaas treatment of about $1.01 million (excluding wages) per child, with an associated internal-rate-of-return of 42% for the Base Case. The Target Sensitivity Case[2] (shaded cell) in Table 7A shows that increasing the percentage of children "with" Lovaas who remain very dependent to 20% yields a net benefit from Lovaas treatment of $0.83 million (excluding wages), with an associated internal-rate-of-return of 35%. Sensitivity test results for various cases other than the Target Sensitivity Case are provided in cells surrounding the shaded cell in Table 7A.

[2] Target Sensitivity Case is defined as the case when the median "with" Lovaas outcome distribution and the median "without" Lovaas outcome distribution occur simultaneously. For example in Table 7A, when the "with" Lovaas outcome distribution varies from 20/60/20 (normal/semi-dependent/very dependent, with the very dependent set at a constant 20% in Table 7A) to 60/20/20, the median "with" Lovaas distribution will be 40/40/20. Similarly, when the "without" Lovaas outcome distribution varies between 0/40/60 to 0/80/20, the median "without" Lovaas distribution will be 0/60/40. Similar concept is followed in Tables 7 (B–E). Results for Target Sensitivity Case are shaded and the corresponding internal-rate-of-return (excluding wages) is calculated in each table.

Table 7B: Cost Savings of Lovaas Treatment By Outcome Distribution where **30%** of children "with" treatment are assumed to remain very dependent; detailed assumptions are listed in the table below:

Outcome	"With" Lovaas	"Without" Lovaas
Normal	20% - 60%	0%
Semi-dependent	10% - 50%	40% - 70%
Very Dependent	**30%**	30% - 60%

The Target Sensitivity Case in Table 7B shows that increasing the percentage of children "with" Lovaas who remain very dependent to 30% yields a net benefit from Lovaas treatment of $0.75 million (excluding wages), with an associated internal-rate-of-return of 32%. Sensitivity test results for various cases other than the Target Sensitivity Case are provided in cells surrounding the shaded cell in Table 7B.

2.2 Increasing the proportion of "Normal" under "Without" Lovaas

Green et al suggest that the assumption that 0% of children "without" treatment appear in the normal functioning category (our assumption (a) above) seems to be biased in favour of Lovaas treatment. They indicate that about 10-20% of a population of children with autism achieve employment independent of specific treatment program. In Tables 7C and 7D, attached, we re-run the model allowing a higher proportion of children "without" treatment in the normal functioning category.

Table 7C: Cost Savings of Lovaas Treatment By Outcome Distribution where **10%** of children "without" treatment are assumed to achieve normal functioning; detailed assumptions are listed in the table below:

Outcome	"With" Lovaas	"Without" Lovaas
Normal	20% - 60%	**10%**
Semi-dependent	30% - 70%	40% - 80%
Very Dependent	10%	10% - 50%

The Target Sensitivity Case in Table 7C shows that increasing the percentage of children "without" Lovaas who obtain normal functioning to 10% yields a net benefit from Lovaas treatment of $0.65 million (excluding wages), with an associated internal-rate-of-return of 28%. Sensitivity test results for various cases other than the Target Sensitivity Case are provided in cells surrounding the shaded cell in Table 7C.

Table 7D: Cost Savings of Lovaas Treatment By Outcome Distribution where 20% of children "without" treatment are assumed to achieve normal functioning; detailed assumptions are listed in the table below:

Outcome	"With" Lovaas	"Without" Lovaas
Normal	20% - 60%	20%
Semi-dependent	30% - 70%	40% - 70%
Very Dependent	10%	10% - 40%

The Target Sensitivity Case in Table 7D shows that increasing the percentage of children "without" Lovaas who obtain normal functioning to 20% yields a net benefit from Lovaas treatment of $0.38 million (excluding wages), with an associated internal-rate-of-return of 22%. For cases surrounding the Target Sensitivity Case in Table 7D, net benefits from Lovaas treatment remain positive except in one case, when the "with" and "without" Lovaas outcome distributions are exactly the same (i.e., there is zero difference in effectiveness between the "with" and "without" treatment scenarios).

This can be explained by the attached Table 3B, where this specific case is explored in terms of annual cost comparison. The net loss is simply the present value of the incremental cost of "with" Lovaas vs "without" Lovaas over the three-year intervention period.

2.3 Increasing the proportion of "Very Dependent" under "With" Lovaas and the proportion of "Normal" under "Without" Lovaas

Table 7E: Cost Savings of Lovaas Treatment By Outcome Distribution where 30% of children "with" treatment are assumed to remain very dependent and 20% of children "without" treatment are assumed to achieve normal functioning; detailed assumptions are listed in the table below:

Outcome	"With" Lovaas	"Without" Lovaas
Normal	20% - 60%	20%
Semi-dependent	10% - 50%	40% - 50%
Very Dependent	30%	30% - 40%

The Target Sensitivity Case in Table 7E shows that increasing the percentage of children "without" Lovaas who obtain normal functioning to 20% and simultaneously increasing the percentage of children "with" Lovaas but remain very dependent to 30% yields a net benefit from Lovaas treatment of $0.30 million (excluding wages), with an associated internal-rate-of-return of 16%. For cases surrounding the Target Sensitivity Case in Table 7E, net benefits from Lovaas treatment remain positive except in one case, when the

"with" and "without" Lovaas outcome distributions are exactly the same (i.e., there is zero difference in effectiveness between the "with" and "without" treatment scenarios).

This can be explained by the attached Table 3C, where this specific case is explored in terms of annual cost comparison. The net loss is simply the present value of the incremental cost of "with" Lovaas vs "without" Lovaas over the three-year intervention period.

2.4 CBA Results of Additional (Downward) Sensitivity Tests

To facilitate the comparison of the Base Case result of our preliminary report with the Target Sensitivity Case results under the alternative scenarios examined in Sections 2.1 – 2.3, Table I below provides a summary of the related results contained in the associated tables.

Table I Net Benefits From Lovaas - Base Case vs Target Sensitivity Cases

Table	Net Benefits (Millions)*	IRR
7	$1.01	42.28%
7A	$0.83	34.97%
7B	$0.75	32.38%
7C	$0.65	27.81%
7D	$0.38	22.19%
7E	$0.30	16.19%

*: *Excluding Wages*

From Tables 7 (A-E) and Table I, we observe the following:

(a) Extending the sensitivity analysis further in the less favourable direction results in reduced net benefits from Lovaas treatment, however, in all of the Target Sensitivity Cases of Tables 7(A-E), net benefits remain substantially positive;

(b) When the surrounding cases in all five tables (Tables 7 (A-E)) are considered, only two yield negative benefits, which occur under the extreme assumption that there is zero difference in effectiveness between the "with" and "without" treatment scenarios;

(c) Of all these alternative scenarios, the internal-rate-of-return for the Target Sensitivity Case remains significantly higher than any of the hurdle rates[3] used in our preliminary CBA study.

Hence, skewing the sensitivity analysis even further towards the "downside" scenarios consolidates the "robustness" of our preliminary CBA results. This conclusion holds before considering the positive effect of increased quality-of-life discussed in Section 6 of our earlier reply to Green et al.

This concludes our supplementary reply.

Yours truly,

Douglas G. Hildebrand
Director

Att.

[3] Discussed in detail in Section 2.8.2 of our preliminary report.

Data Appendix: Description of Cost Derivation and Data Sources for Costs Used in CBA Study of Lovaas Treatment

Cost Item	Cost Used in CBA (Bolded Figures)	Detailed Cost Derivation	Data Source
Child Care			
Early Intensive Intervention (Lovaas Treatment Cost)	**$65,000**	Sum of the four major categories, rounded to the nearest $1,000 (For all 3 "with" treatment" Outcomes).	Therapists and consultant's service charges are based on information from B.C. families currently running programs in B.C. (as provided through counsel); Traveling expenses include airline ticket, hotel accommodations, car rentals and food/meals; Teaching materials include arrangement cost for professional workshops and seminars, etc.
	$28,080	- Junior Therapists @ $15/hour for 36 hours/week, 52 weeks/year	
	$7,800	- Senior Therapists @ $25/hour for 6 hours/week, 52 weeks/year	
	$16,500	- Consultant @1,500/day for minimum of 9 days/year, plus a minimum of $3,000 travel expenses/year	
	$13,095	- Teaching Materials @25% of the total of Therapists and Consultant service charges	
Respite Services	**$3,700**	Mid-point of cost range $3,200 and $4,100, rounded to the nearest $100.	Cost ranges are based on information from B.C. families currently running programs in B.C. (as provided through counsel)
Behaviour Support	**$8,300**	Directly based on cost amount provided, rounded to the nearest $100.	Based on information from B.C. families currently running programs in B.C. (as provided through counsel)
Supported Childcare	**$9,600**	Directly based on cost amount provided, rounded to the nearest $100.	Based on information from B.C. families currently running programs in B.C. (as provided through counsel)
Placement	**$32,400**	Based on the lower range of $2,700 - $7,500 monthly costs, for 12 months	Cost ranges are monthly residential costs per child based on Gateway Task Force Report, October 1997
Education			
Normal	**$4,000**	Based on cost amount provided. (For Outcome 1 only)	Ministry of Attorney General, Legal Service Branch, October 15, 1999 (Page 2)
Low incidence/high cost	**$27,650**	@ 70% of the cost quoted for 'Intensive Special' (For Outcome 2 only)	
Intensive Special	**$39,500**	$16,500 + A top-up amount, Top-up Amount = ($18,000 +$28,000)/2	$16,500 is the grant per child with autism or ASD provided by government, based on inofrmation provided by Ministry of Attorney General, Legal Service Branch, October 15, 1999 (Page 3); top-up amount is based on information provided by counsel
Adult Care			
Day Program	**$26,400**	@ $2,200/month for12 months	Based on information contained in the survey conducted by the Ministry of Children and Families Tab 4, Graph 3: Residential Services 1998/99, Types of Services and Associated Cost per day; Gateway Contracts - Residential
Residential (Family Home)	**$71,820**	@ 70% of the cost quoted for 'Residential (Group Home)' (For Outcome 2 only)	
Residential (Group Home)	**$102,600**	Sum of two kinds of residential placement for adults, namely, family homes ($22,630) and group home ($80,003), rounded to the nearest $100.	Both figures are based on information contained in the survey conducted by the Ministry of Children and Families Tab 4, Graph 4: Residential Services, Staffed Group Homes vs. Family Care

Table 2A Estimated Costs For The "Without" Lovaas Treatment Scenario

	Outcome 1: Normal			Outcome 2: Semi-dependent			Outcome 3: Very Dependent		
Cost Item	Annual Amount	Starting Age	Ending Age	Annual Amount	Starting Age	Ending Age	Annual Amount	Starting Age	Ending Age
Child Care									
Respite Services	$2,590	3	6	$2,590	3	19	$3,700	3	19
Behaviour Support	$5,810	3	6	$5,810	3	19	$8,300	3	19
Supported Childcare	$6,720	3	6	$6,720	3	12	$9,600	3	18
Placement	$22,680	3	6	$22,680	3	19	$32,400	3	19
Education									
Normal	$4,000	6	19	$0	N/A	N/A	$0	N/A	N/A
Low incidence/high cost	$0	N/A	N/A	$27,650	6	19	$0	N/A	N/A
Intensive Special	$0	N/A	N/A	$0	N/A	N/A	$39,500	6	19
Adult Care									
Day Program	$0	N/A	N/A	$18,480	19	LFT	$26,400	19	LFT
Residential (Family Home)	$0	N/A	N/A	$71,820	19	LFT	$0	N/A	N/A
Residential (Group Home)				$0	N/A	N/A	$102,600	19	LFT

LFT: lifetime

Table 3A Expected Annual Costs and Cost Savings - Base Case

	Costs for With Lovaas Treatment				Costs for Without Lovaas Treatment				Annual Cost Savings
	Annual Amount				Annual Amount				
Age Range	Normal	Semi-Dependent	Very Dependent	Expected Annual Cost	Normal	Semi-Dependent	Very Dependent	Expected Annual Cost	
Weight	40%	50%	10%	100%	0%	50%	50%	100%	
3 - 6	65,000	65,000	65,000	**65,000**	37,800	37,800	54,000	**45,900**	**-19,100**
6 - 12	4,000	65,450	93,500	**43,675**	4,000	65,450	93,500	**79,475**	**35,800**
12 - 18	4,000	58,730	93,500	**40,315**	4,000	58,730	93,500	**76,115**	**35,800**
18 - 19	4,000	58,730	83,900	**39,355**	4,000	58,730	83,900	**71,315**	**31,960**
19 +	0	90,300	129,000	**58,050**	0	90,300	129,000	**109,650**	**51,600**

Table 3B Expected Annual Costs and Cost Savings

- Outcome Distribution as 20/70/10 for both "with" and "without" Lovaas Treatment

	Costs for With Lovaas Treatment				Costs for Without Lovaas Treatment				Annual Cost Savings	PV Cost Savings
	Annual Amount				Annual Amount					
Age Range	Normal	Semi-Dependent	Very Dependent	Expected Annual Cost	Normal	Semi-Dependent	Very Dependent	Expected Annual Cost		
Weight	20%	70%	10%	100%	20%	70%	10%	100%		
3 - 6	65,000	65,000	65,000	**65,000**	37,800	37,800	54,000	**39,420**	-25,580	-72,879
6 - 12	4,000	65,450	93,500	**55,965**	4,000	65,450	93,500	**55,965**	**0**	**0**
12 - 18	4,000	58,730	93,500	**51,261**	4,000	58,730	93,500	**51,261**	**0**	**0**
18 - 19	4,000	58,730	83,900	**50,301**	4,000	58,730	83,900	**50,301**	**0**	**0**
19 +	0	90,300	129,000	**76,110**	0	90,300	129,000	**76,110**	**0**	**0**

Table 3C Expected Annual Costs and Cost Savings

- Outcome Distribution as 20/50/30 for both "with" and "without" Lovaas Treatment

	Costs for With Lovaas Treatment				Costs for Without Lovaas Treatment				Annual Cost Savings	PV Cost Savings
	Annual Amount				Annual Amount					
Age Range	Normal	Semi-Dependent	Very Dependent	Expected Annual Cost	Normal	Semi-Dependent	Very Dependent	Expected Annual Cost		
Weight	20%	50%	30%	100%	20%	50%	30%	100%		
3 - 6	65,000	65,000	65,000	**65,000**	37,800	37,800	54,000	**42,660**	**-22,340**	**-63,648**
6 - 12	4,000	65,450	93,500	**61,575**	4,000	65,450	93,500	**61,575**	**0**	**0**
12 - 18	4,000	58,730	93,500	**58,215**	4,000	58,730	93,500	**58,215**	**0**	**0**
18 - 19	4,000	58,730	83,900	**55,335**	4,000	58,730	83,900	**55,335**	**0**	**0**
19 +	0	90,300	129,000	**83,850**	0	90,300	129,000	**83,850**	**0**	**0**

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Table 7A Cost Savings of Lovaas Treatment By Outcome Distributions

Target Sensitivity Case (Shaded)			
"With" Lovaas		"Without" Lovaas	
40%	Normal	0%	Normal
40%	Semi-dependent	60%	Semi-dependent
20%	Very Dependent	40%	Very Dependent

Excluding Wages					
"With" Lovaas	"Without" Lovaas Outcome Distribution				
Outcome Distribution	0/40/60	0/50/50	0/60/40	0/70/30	0/80/20
20/60/20	646,773	558,862	470,951	383,040	295,129
30/50/20	828,470	740,559	652,648	564,737	476,826
40/40/20	1,010,166	922,255	834,344	746,434	658,523
50/30/20	1,191,863	1,103,952	1,016,041	928,130	840,219
60/20/20	1,373,559	1,285,649	1,197,738	1,109,827	1,021,916

Including Wages					
"With" Lovaas	"Without" Lovaas Outcome Distribution				
Outcome Distribution	0/40/60	0/50/50	0/60/40	0/70/30	0/80/20
20/60/20	765,892	654,530	543,167	431,805	320,442
30/50/20	960,245	848,883	737,520	626,158	514,796
40/40/20	1,154,598	1,043,236	931,873	820,511	709,149
50/30/20	1,348,951	1,237,589	1,126,226	1,014,864	903,502
60/20/20	1,543,304	1,431,942	1,320,580	1,209,217	1,097,855

Note: IRR for the Target Sensitivity Case = 34.97%

Table 7B Cost Savings of Lovaas Treatment By Outcome Distributions

Target Sensitivity Case (Shaded)			
"With" Lovaas		"Without" Lovaas	
40%	Normal	0%	Normal
30%	Semi-dependent	60%	Semi-dependent
30%	Very Dependent	40%	Very Dependent

Excluding Wages				
"With" Lovaas	"Without" Lovaas Outcome Distribution			
Outcome Distribution	0/40/60	0/50/50	0/60/40	0/70/30
20/50/30	563,478	475,567	387,656	299,745
30/40/30	745,174	657,263	569,352	481,442
40/30/30	926,871	838,960	751,049	663,138
50/20/30	1,108,567	1,020,657	932,746	844,835
60/10/30	1,290,264	1,202,353	1,114,442	1,026,531

Including Wages				
"With" Lovaas	"Without" Lovaas Outcome Distribution			
Outcome Distribution	0/40/60	0/50/50	0/60/40	0/70/30
20/50/30	659,145	547,783	436,420	325,058
30/40/30	853,498	742,136	630,773	519,411
40/30/30	1,047,851	936,489	825,127	713,764
50/20/30	1,242,204	1,130,842	1,019,480	908,117
60/10/30	1,436,557	1,325,195	1,213,833	1,102,470

Note: IRR for the Target Sensitivity Case = 32.38%

Table 7C Cost Savings of Lovaas Treatment By Outcome Distributions

Target Sensitivity Case (Shaded)			
"With" Lovaas		"Without" Lovaas	
40%	Normal	10%	Normal
50%	Semi-dependent	60%	Semi-dependent
10%	Very Dependent	30%	Very Dependent

Excluding Wages

"With" Lovaas Outcome Distribution	"Without" Lovaas Outcome Distribution				
	10/40/50	10/50/40	10/60/30	10/70/20	10/80/10
20/70/10	460,461	372,550	284,639	196,728	108,817
30/60/10	642,158	554,247	466,336	378,425	290,514
40/50/10	823,854	735,943	648,032	560,121	472,211
50/40/10	1,005,551	917,640	829,729	741,818	653,907
60/30/10	1,187,247	1,099,336	1,011,426	923,515	835,604

Including Wages

"With" Lovaas Outcome Distribution	"Without" Lovaas Outcome Distribution				
	10/40/50	10/50/40	10/60/30	10/70/20	10/80/10
20/70/10	566,923	455,561	344,199	232,836	121,474
30/60/10	761,277	649,914	538,552	427,189	315,827
40/50/10	955,630	844,267	732,905	621,542	510,180
50/40/10	1,149,983	1,038,620	927,258	815,896	704,533
60/30/10	1,344,336	1,232,973	1,121,611	1,010,249	898,886

Note: IRR for the Target Sensitivity Case = 27.81%

Table 7D Cost Savings of Lovaas Treatment By Outcome Distributions

Target Sensitivity Case (Shaded)			
"With" Lovaas		"Without" Lovaas	
40%	Normal	20%	Normal
50%	Semi-dependent	50%	Semi-dependent
10%	Very Dependent	30%	Very Dependent

Excluding Wages				
"With" Lovaas	"Without" Lovaas Outcome Distribution			
Outcome Distribution	20/40/40	20/50/30	20/60/20	20/70/10
20/70/10	190,854	102,943	15,032	-72,879
30/60/10	372,550	284,639	196,728	108,817
40/50/10	554,247	466,336	378,425	290,514
50/40/10	735,943	648,032	560,121	472,211
60/30/10	917,640	829,729	741,818	653,907

Including Wages				
"With" Lovaas	"Without" Lovaas Outcome Distribution			
Outcome Distribution	20/40/40	20/50/30	20/60/20	20/70/10
20/70/10	261,208	149,846	38,483	-72,879
30/60/10	455,561	344,199	232,836	121,474
40/50/10	649,914	538,552	427,189	315,827
50/40/10	844,267	732,905	621,542	510,180
60/30/10	1,038,620	927,258	815,896	704,533

Note: IRR for the Target Sensitivity Case = 22.19%

Table 7E Cost Savings of Lovaas Treatment By Outcome Distributions

Target Sensitivity Case (Shaded)			
"With" Lovaas		"Without" Lovaas	
40%	Normal	20%	Normal
30%	Semi-dependent	50%	Semi-dependent
30%	Very Dependent	30%	Very Dependent

Excluding Wages		
"With" Lovaas	"Without" Lovaas Outcome Distribution	
Outcome Distribution	20/40/40	20/50/30
20/50/30	24,263	-63,648
30/40/30	205,959	118,048
40/30/30	387,656	299,745
50/20/30	569,352	481,442
60/10/30	751,049	663,138

Including Wages		
"With" Lovaas	"Without" Lovaas Outcome Distribution	
Outcome Distribution	20/40/40	20/50/30
20/50/30	47,714	-63,648
30/40/30	242,067	130,705
40/30/30	436,420	325,058
50/20/30	630,773	519,411
60/10/30	825,127	713,764

Note: IRR for the Target Sensitivity Case = 16.19%

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DOUGLAS G. HILDEBRAND, B.A. (Economics), M.B.A.

A. Overview Résumé – Litigation Economics

Mr. Hildebrand holds a B.A. Economics (with Distinction) from the University of Saskatchewan (1969) and a Master of Business Administration (M.B.A.) from the University of British Columbia (1971).

During the 1968 to 1972 period, Mr. Hildebrand held economic research positions with the federal government and the University of British Columbia. Since 1972, Mr. Hildebrand has been practising as a Senior Economic Consultant based in Vancouver, and has been practising at the Partner level since 1975. He has been Director of Columbia Pacific Group, a management and economic consulting firm, since 1980.

A primary area of practice includes economic and financial assessments for litigation, regulatory and project approval purposes (courts, administrative and regulatory tribunals, arbitration hearings, government review agencies). Mr. Hildebrand's consulting activities include assessment of damages in personal injury and fatality cases; and economic assessments of major projects and policies (e.g., cost-benefit analysis), including major project facility applications before Canadian regulatory authorities and review agencies.

Mr. Hildebrand has undertaken over 1,000 assignments since the mid-1980s involving economic and financial assessments of damage claims for personal injury and fatality cases. Assessments have included earnings projections for educational referent groups and a broad range of occupations inclusive of statistical labour market contingencies; income allocations in fatality cases for the purpose of determining loss of financial support; assessment of household services; income and cost of care multipliers; present value of care costs; management fee and tax gross-up simulations; critique of expert reports; and expert testimony in B.C. Supreme Court on numerous occasions.

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Mr. Hildebrand is a member of professional economist associations including member and Past President of the Association of Professional Economists of British Columbia.

Mr. Hildebrand is also trained as a commercial arbitrator/mediator, practises as a mediator of personal injury cases and is a member of the BC Arbitration and Mediation Institute and the Commercial Mediation Association.

This is Exhibit A *referred to in the affidavit of* Douglas G. Hildebrand *sworn before me, at* Vancouver, BC *this* 23rd *day of* March *20*00

.....

DOUGLAS G. HILDEBRAND – Résumé (Cont'd.)

B. Cost-Benefit Analysis Experience

Mr. Hildebrand is experienced in undertaking cost-benefit analysis (CBA) and/or discounted-cash-flow (DCF) analysis of proposed capital projects and policies covering most key sectors of the economy.

CBA assessments have been undertaken by Mr. Hildebrand in accordance with provincial (British Columbia) and/or federal government guidelines on cost-benefit analysis. Net benefits have been determined and tested under a range of assumptions including costs, discount rates, markets (volume, prices) and environmental externalities (e.g., air pollution). Adjustments have been applied to labour and non-market resources, where appropriate, ("shadow prices") in the valuation of costs and benefits. Examples of CBA and related economic/financial assessments undertaken by Mr. Hildebrand include the following:

Representative Projects – Economic/Financial Analysis

- Cost-Benefit Analysis of the Vancouver Island Natural Gas Pipeline	Inland Natural Gas Co. Ltd.
- Cost-Benefit Analysis of Oil Transportation Projects	TransMountain Oil Pipeline Co.
- Cost-Benefit Analysis of Aluminum Smelter and Hydro Power Complex	Aluminum Company of Canada, Ltd
- Cost-Benefit Analysis of Railway Bridge Options (with Crippen)	Public Works Canada
- Cost-Benefit Analysis of Relocating Rail Lines in Vancouver's Urban Core	City of Vancouver
- Cost-Benefit Analysis of Natural Gas Vehicle Use	BC Hydro
- Cost-Benefit Analysis of Natural Gas Exports	Pan Alberta Gas

Representative Projects – Economic/Financial Analysis

- Cost-Benefit Analysis of Natural Gas Processing Facilities in Northeast B.C.	Westcoast Energy Inc.
- Cost-Benefit analysis of a Hydroelectric Project	B.C. Hydro
- Cost-Benefit Analysis of Airport Road/Ferry Improvements	City of Prince Rupert
- Financial (DCF) Valuation of the Line Creek Coal Mine	Shell Canada Resources
- Financial (DCF) Valuation of the Quintette Coal Mine	Denison Mines Ltd.
- Financial (DCF) Valuation of the Balmer and Greenhills Coal Mines	Westar Mining Ltd.
- Financial (DCF) Valuation of Ridley Terminals	Ridley Terminals Inc.
- Cost-Benefit Valuation of the UBC Co-generation Project	University of British Columbia
- Cost-Benefit Valuation of Electricity Exports from B.C.	B.C. Utilities Commission
- Cost-Benefit Valuation of Private Hydro Projects in B.C.	Iskut Pulpower; Canadian/French Consortium
- Cost-Benefit Valuation of Gold-Copper Mine in B.C.	Private Mining Company
- Financial (DCF) Valuation of Independent Power Producer	Private Arbitration
- Cost-Benefit Valuation of Non-Power Uses of Hydroelectric Reservoir	BC Hydro
- Financial Impact of Container Port Expansion at Roberts Bank	Vancouver Port Corp; Corporation of Delta
- Cost-Benefit Analysis of Strategies to Enhance Pacific Rim Traffic Links through Vancouver International Airport	Transport Canada

DOUGLAS G. HILDEBRAND – Résumé (Cont'd.)

C. *Expert Witness Appearances – Economic/Financial Analysis*

- B.C. Supreme Court (numerous appearances)
- Federal Court of Canada
- Superior Court, State of Washington
- Assessment Appeal Board of B.C.
- Expropriation Compensation Board of B.C.
- B.C. Utilities Commission
- Manitoba Public Utilities Board
- National Energy Board
- National Farm Products Marketing Council
- Private Commercial Arbitrations
- Environmental Assessment Hearing

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Ex. B to Affidavit of Douglas G. Hildebrand dated March 23, 2000

HB 2727

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Preliminary Report

Cost-Benefit Analysis of Lovaas Treatment For Autism and Autism Spectrum Disorder (ASD)

This is Exhibit "B" referred to in the affidavit of Douglas G. Hildebrand sworn before me, at Vancouver, BC this 23rd day of March 2000

A COMMISSIONER FOR TAKING AFFIDAVITS FOR BRITISH COLUMBIA

Prepared for
Harper Grey Easton
Barrister and Solicitors

Submitted by
Columbia Pacific Consulting
1550 – 650 West Georgia Street
Vancouver, B.C. V6B 4N8

December 7, 1999

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1.0 Introduction and Summary

Columbia Pacific Consulting was retained by Harper Grey Easton to undertake a preliminary cost-benefit analysis of the Lovaas treatment. The primary objective of the study is to determine if the Lovaas treatment represents an efficient allocation of government health care expenditures.

Columbia Pacific developed the analytical framework for the study including a computerized cost-benefit model which is capable of efficiently producing results for a range in key assumptions. The basic methodology applied in this analysis is consistent with cost-benefit studies[1] conducted in the United States. The key "cost" assumptions which essentially drive the model were developed through discussion with Harper Grey Easton and, in turn, extensive material provided to Harper Grey Easton by the provincial government.

Principal benefits of Lovaas treatment is the avoided cost of care services which may persist over the individual's lifetime if no such treatment is received in the individual's early childhood. In addition to the cost savings, an additional benefit from the Lovaas treatment is the increased expected lifetime earnings an individual with autism or ASD may enjoy over his/her lifetime.

The cost-benefit analysis is carried out in constant 2000 Canadian dollars over a hypothetical 3-year-old's lifetime. The cost-benefit model has been applied to a Base Case ("most likely" case) as well as various other cases where key assumptions in the Base Case are altered for purposes of sensitivity analysis. Parameters subject to sensitivity test include:

- the outcome distributions in both "with" and "without" Lovaas treatment scenarios;
- the cost of Lovaas early intensive intervention;
- the actual current provincial government funding for care and services relative to the Base Case level;
- the cost level assumed in the analysis;
- the effectiveness of the Lovaas treatment;

[1] John W. Jacobson et al (1996), *Financial Cost and Benefits of Intensive Early Intervention for Young Children with Autism – Pennsylvania Model Achieving Cost Savings.*

- the discount rate.

Two evaluation criteria are employed to assess the results: net benefits and internal rate-of-return[2].

The results of our preliminary study indicate substantial per capita cost savings from the Lovaas treatment over a 3-year-old's lifetime. A listing of some preliminary results is provided below relative to our valuation date of April 1, 2000:

- In the Base Case, the cost savings per child are estimated at $1,005,600 excluding labour income and $1,150,000 including labour income, assuming the Law and Equity Act real discount rate of 3.5% for service costs and 2.5% for labour income; the estimated internal rate-of-return is approximately 42%[3];

- In the case where the lowest success rate in "with" Lovaas treatment scenario is obtained, the cost savings per child are estimated at $642,200 excluding labour income and $761,300 including labour income; the estimated internal rate-of-return is approximately 31%;

- In the case where the cost for Lovaas early intensive intervention is 30% higher than the assumed level in the Base Case, the cost savings per child are estimated at $950,000 excluding labour income and $1,094,400 including labour income; the estimated internal rate-of-return is approximately 25%;

- In the case where the success rate in "with" Lovaas treatment is 50% higher than the assumed rate in the Base Case, the cost savings per child are estimated to be $1,368,900 excluding labour income and $1,538,700 including labour income; the estimated internal rate-of-return is approximately 52%;

- In the case where actual current government expenditure on care services is 20% below the assumed level in the Base Case, the cost savings per child is estimated at $767,400 excluding labour income and $911,800 including labour income; the estimated internal rate-of-return is approximately 27%;

- With a real discount rate at 8%, the cost savings per child are estimated at $369,800 excluding labour income and $395,600 including labour income.

[2] Net benefits are discounted to present value at a specified discount rate (cost of capital). Internal rate-of-return is the real discount rate that equates benefits and costs.

[3] This internal rate-of-return is calculated based on cost savings excluding wage income. Including wage income increases this return by less than one percentage point.

This preliminary report consists of four sections. Section 2.0 outlines the analytical framework that was used in the cost-benefit analysis. Section 3.0 presents the main results from the Base Case as well as those from the sensitivity analysis. Section 4.0 provides the cost-benefit study conclusion.

2.0 Cost-Benefit Analysis Framework

2.1 Overview

The general framework is one of comparing the expected lifetime costs for a child afflicted by autism or autism spectrum disorder (ASD) under two alternative scenarios: (i) "with" Lovaas treatment; (ii) "without" Lovaas treatment.

In order to determine expected lifetime costs, annual cost estimates are developed from age 3 (the assumed optimum age to commence Lovaas treatment) over the lifetime. A normal life expectancy is assumed for both the "with" and "without" treatment scenarios.

In the "with" treatment scenario, the candidate child is assumed to undergo intensive Lovaas treatment for three years (age 3 to 6), and to require no other services concurrent with treatment. The annual cost of and need for services following treatment depends on the treatment outcome: normal, semi-dependent and very dependent. Cost estimates are made for each outcome as the candidate progresses through childhood, adolescence and adulthood. Service costs pertain to health care, education and residential care.

In the "without" treatment scenario, annual cost estimates for health care, education and residential care are made from age 3 onwards relative to two potential outcomes; semi-dependent and very-dependent. Normal functioning is not assumed as a possible outcome "without" treatment.

Lovaas treatment is assumed to improve the candidate child's functioning. Without treatment the outcomes are assumed to be 50:50[4] in terms of semi-dependent and very-dependent. With treatment, a certain percentage chance is attributed to normal functioning and the probability of semi-dependent and very-dependent outcomes are assumed to decrease relative to the without treatment scenarios.

It can be envisioned, therefore, that the focus of the cost-benefit analysis is essentially comparing the front-end investment at an early age of intensive Lovaas treatment, on the one hand, and cost savings triggered by the treatment due to improved functioning, on the other.

[4] This is the assumed outcome distribution for the "without" treatment scenario in the Base Case.

In addition to cost savings as the primary benefit of investing in Lovaas treatment, the cost-benefit analysis also explores and quantifies the benefit of added labour income due to improved functioning with Lovaas treatment. Labour income is a key component of Gross Domestic Product (GDP) of British Columbia, and the analysis estimates the additional labour income (earnings) triggered by Lovaas treatment relative to the without treatment scenario. Basically, the added labour income can be viewed as an "opportunity cost" without treatment (forgone income) which is now captured with treatment.

The analysis provides for gender distributions as the incidence rate of autism and ASD is heavily skewed. Differential mortality rates for men and women (Statistics Canada's Life Table, 1990-1992) are incorporated into the analysis. Differential earnings for men and women (by assumed education level) are also incorporated into the analysis. No gender distinction, however, is made in respect of the annual cost of services.

All costs and benefits (expressed in constant 2000 dollars) are discounted to present value applying real, pre-tax discount rate in accordance with the Law and Equity Act, at your direction. The cost-benefit model calculates net benefits and internal-rate-of-return, the key measures of efficiency. These key measures are calculated for a Base Case, which reflects "most likely" estimates for costs and outcomes. Sensitivity analysis then explores the effect of altering key assumptions in terms of costs, outcomes and discount rates.

The analytical framework is generally consistent with the provincial government's Guidelines for Benefit-Cost Analysis (1977).

2.2 Costs "With" Lovaas Treatment

The costs for the "with" Lovaas treatment scenario are identified in Table 1, attached. These costs are allocated to three broad categories as follows:

(i). Child Care

(ii). Education

(iii). Adult Care

Each major category is further broken down into detailed service items. Estimates of the annual amount of these cost items were prepared by Columbia Pacific based on information from several sources. Data sources include information provided by Harper Grey Easton and reports prepared by various private and public sector organizations both in Canada and the United States. All the costs are assumed to be mutually exclusive.

The need for services following treatment depends on the treatment outcomes. Three possible Lovaas treatment outcomes are listed as follows:

Outcome 1: children who achieve normal functioning, participate in regular education with little or no support, and are vocationally productive as adults;

Outcome 2: children who derive sufficient benefit from early intensive intervention that they are then able to participate in nonintensive special education, and evidence persisting but reduced dependency in adulthood;

Outcome 3: children who achieve meaningful functional improvements but still require specialized and intensive educational and adult services.

U.S. research has demonstrated that significant proportions of children with autism or ASD who participate in Lovaas treatment achieved normal (Outcome 1) or near-normal functioning (Outcome 2), whereas a small proportion (about 10% across several studies) appeared to continue to need intensive intervention beyond the early childhood years (i.e., Outcome 3). In any group of children with autism or ASD who receive Lovaas treatment, between 20% to 60% will achieve normal functioning. Ten percent (10%) will continue to require intensive special education and intensive adult care, and the remainder will evidence benefit sufficient to reduce the intensity of educational and adult care requirements.

For purposes of Base Case analysis, we assume 40% will achieve normal functioning (Outcome 1), 50% will achieve semi-dependent (Outcome 2) and 10% remains very dependent (Outcome 3). In the sensitivity analysis, we explore the effect of changing the percentage of outcome distributions[5].

2.3 Cost "Without" Lovaas Treatment

The costs for the "without" Lovaas treatment scenario are identified in Table 2, attached. Although cost items are categorized similarly in both "with" and "without" treatment scenarios, there are two major differences in terms of (i) outcome types and (ii) cost duration within the Child Care category.

The first difference is that in the "without" treatment scenario, only two potential outcomes are assumed to be possible; semi-dependent (Outcome 2) and very dependent (Outcome 3). Normal functioning (Outcome 1) is not assumed as a possible outcome "without" treatment.

[5] In the sensitivity analysis, while the percentages of Outcome 1 and Outcome 2 may vary, the percentage of Outcome 3 is assumed to remain at 10% in all cases.

The second difference is that under the "without" treatment scenario, the cost duration for certain cost items in the Child Care starts from age 3 instead of age 6, as there is no Lovaas early intensive intervention between age 3 to 6.

For purposes of Base Case analysis, we assume 50% will achieve semi-dependent functioning (Outcome 2) and 50% remain very dependent (Outcome 3). In the sensitivity analysis, we explore the effect of changing the percentage of outcome distributions.

With regard to annual cost amount, except for Lovaas early intensive intervention and service costs for Outcome 1 in the "with" treatment scenario, service costs for Outcome 2 (or 3) are assumed to be the same in both "with" and "without" treatment scenarios in the Base Case. In terms of cost relationship between Outcomes 2 and 3, all costs for Outcome 2 are assumed to be 70% of those for Outcome 3. In sensitivity analysis, we examine the effect of changing the cost percentage of Outcome 2 relative to Outcome 3. In addition, we will also test the results by increasing the effectiveness of Lovaas treatment (i.e., for the same outcome, required service will be less in the "with" treatment scenario than in the "without" scenario).

2.4 Benefits of Lovaas Treatment

2.4.1 Cost Savings of Lovaas Treatment

The primary benefit of the Lovaas treatment is the expected cost savings in health, education and care expenditures.

Table 3 summaries the annual cost by age group for both "with" and "without" treatment scenarios in the Base Case, it also provides the cost savings in the Base Case.

Table 3 indicates that expected costs over an individual's lifetime in the "with" treatment scenario differ from those in the "without" treatment scenario. Due to its intensive early treatment cost and higher expected success rate, expected annual costs incurred by an individual receiving the treatment tend to be higher during the treatment period, but substantially lower for the remaining lifetime. The cost savings from the Lovaas treatment is reflected in the difference in net present value of lifetime care costs incurred in the "without" and "with" treatment scenarios. If this difference is positive, it indicates a net cost savings from the Lovaas treatment to the society.

In deriving the net present values of cost for both scenarios, we have applied discount rate[6] and normal survival rates for Canadian male/female (based on Statistics Canada's 1990-92 Life Tables) to the cost items listed in Tables 1 and 2.

2.4.2 Increases in Labour Income and GDP from the Lovaas Treatment

In addition to the cost savings, an added benefit from the Lovaas treatment is that it may increase the expected labour income that an individual with autism or ASD can earn over his/her lifetime. As labour income is a key component of Gross Domestic Product (GDP) of British Columbia, an increase in the expected lifetime earnings triggered by the Lovaas treatment tend to increase the net gain from the treatment.

The lifetime labour income projections are conducted under the following assumptions:

Outcome 1: Individuals who achieve normal functioning may participate in the labour market as independent employees. To be conservative, we assume that their full-time full-year earnings are commensurate with 90%[7] of average BC male/female with all levels of schooling. Labour market contingencies are in line with the educational referent group average. Labour market entry is assumed to occur in the mid-year when the individual turns age 19;

U.S. research indicates that individuals who derive sufficient benefits from early treatment but still require on-going adult care (Outcome 2) and individuals who achieve limited functional improvement (Outcome 3) cannot function as independent employees but may enjoy "supported employment wages". As such, our corresponding labour income assumptions are listed below:

Outcome 2: Full-time full-year earnings are commensurate with average BC male/female in low skill jobs and are adjusted for contingencies of average BC male/female with grade 9-10 education. Labour market entry is assumed to occur in the mid-year when the individual turns age 21;

Outcome 3: Full-time full-year earnings are commensurate with 75% of average BC male/female in minimum wage jobs and are adjusted for contingencies of average BC male/female with grade 9-10 education. Labour market entry is assumed to occur in the mid-year when the individual turns age 21;

[6] The discount rate applied in the future care cost estimates is 3.5% per annum (as specified under the Law and Equity Act).

[7] Lovaas (1993) and Lovaas (1987) clearly indicate that "certain residual deficits may remain in the normal functioning group that cannot be detected by teachers and parents and can only be isolated on closer psychological assessment, particularly as these children grow older."

In all three cases, we assume a retirement age of 65.

The lifetime earnings projections include normal survival rates for Canadian males/females (based on Statistics Canada's 1990-92 Life Tables), and discounting at 2.5% per annum (as specified under the Law and Equity Act).

Our projections include estimates of Employment Insurance (EI) benefits net of the individual's own contributions. In addition, we also include a 6% allowance for other non-wage benefits in our estimates[8].

We note that we have delayed the labour market entry ages for all three scenarios to allow the possibility that individuals with autism may spend longer time to obtain the assumed education level.

2.5 Discount Rate

At your direction, in estimating the present value of the lifetime cost of care and education, we have applied a real discount rate of 3.5 percent per annum compound pursuant to the Law and Equity Act. In estimating the present value of lifetime employment income, we have applied a real discount rate of 2.5 percent per annum compound pursuant to the Law and Equity Act.

In Section 2.8.2 below, we discuss our calculation of the internal rate-of-return, which is to be compared with other hurdle rates.

2.6 Study Period

The period of analysis is the hypothetical 3-year-old candidate's remaining lifetime. For purposes of calculation, we assume a normal life expectancy in our study in accordance with the Statistics Canada Life Table, 1990-1992.

2.7 Incidence Rate by Gender

Recent epidemiological studies indicate that autism occurs in approximately 1 of 1000 people, with males outnumbering females by approximately 4 to 1. There is also evidence that there may be an equal number of "autistic-like" individuals[9]. As such, in our study, we have assumed the incidence ratio between male and female as 4:1.

[8] Earnings projections on this basis are provided in Tables 15 - 20 in the appendix.

[9] Individuals with many features of autism, but not enough to meet standard diagnostic criteria.

2.8 Cost-Benefits Measures

2.8.1 Net Benefits Per Candidate Child

The cost-benefit analysis is conducted on a per candidate child basis. Three criteria can be employed in the cost-benefit analysis: net benefits, benefit-cost ratio and internal rate-of-return. Each of these three criteria is a good measure of the efficiency of resource allocation and will yield complementary results.

Net benefits are the present value of the difference between the costs from the "without" and "with" treatment scenarios. In this analysis, net benefits are also reflected in the additional expected labour income enjoyed by those who have received Lovaas treatment.

The benefit-cost ratio is the ratio of discounted benefits to discounted costs. It indicates the relative size of the benefits in comparison to the costs. The decision criterion is that the benefit-cost ratio should exceed unity.

The internal rate-of-return is the discount rate that equates the present value of net benefits to zero. It measures the rate of return of resources invested in a particular option, and the decision criterion is that the internal rate-of-return should exceed the social opportunity cost of capital.

In choosing between alternatives directed at a specific objective, it is important to consider more than one criterion since different criteria provide complementary information about the efficiency of a particular alternative. In this analysis, we focus on two of these three criteria: net benefits and internal rate-of-return.

2.8.2 Internal Rate-of-Return Comparisons

The Base Case analysis resulted in an internal rate-of-return (IRR) of approximately 42%. This IRR result can be compared with the following hurdle (discount) rates:

i). Law and Equity Act Specified Discount Rates

Under the Law and Equity Act, the real discount rate applied to future care costs is 3.5% per annum, and the real discount rate applied to wage income is 2.5% per annum, with an 1% allowance for real wage growth.

ii). British Columbia Bond Rate

The cost of new borrowing by the provincial government can be approximated by the yield on long term British Columbia Government Bonds. In real terms, the yield on long term BC Government Bonds is currently about 4.5%[10].

iii). BC Government's Discount Rate for Capital Investments

In assessment of major capital projects, the BC Government and its crown corporations typically apply a real, pre-tax discount rate of 8%. The Multiple Account Evaluation Guidelines prepared by the BC Government's Crown Corporations Secretariat (February 1993) indicates that an 8% real discount rate "... should be used for purposes of a base case analysis" (page 11). Similarly, BC Hydro's policy is to apply an 8% real, pre-tax discount rate in evaluation of future investment options, as set out in its Resource Acquisition Policy (June, 1994). The 8% real discount rate is generally consistent with the discount rate concept set out in the provincial guidelines on cost-benefit analysis.

Discount rates under the Law and Equity Act are applied in personal injury and fatal accident cases before the Courts. The 3.5% real discount rate is intended to reflect the long-term rate-of-return on secure investments in the economy. The BC Government Bond yield (currently about 4.5% real) is intended to reflect the cost of new borrowing to the Province. The 8% real discount rate for capital projects (e.g., highways and ferries, hydroelectric dams, etc.) sets a stringent standard for capital-intensive use of government resources, based on the social opportunity cost of capital in the private sector (i.e., highest alternative use of investment capital).

2.9 Sensitivity Analysis

Sensitivity analysis is important because it examines the changes in cost-benefit results when key assumptions underlying the analysis are varied. Sensitivity analysis is usually structured in order to assess the project's "upside" and "downside" potential or risk.

In this study, the thrust of sensitivity analysis is to determine how alternative assumptions affect overall net benefits from Lovaas treatment. The principal sensitivity parameters in this analysis include the outcome distributions in both "with" and "without" Lovaas treatment scenarios, the cost of Lovaas early intensive intervention, the actual current

[10] The nominal yield on BC Government Bonds (maturing June, 2029) is currently 6.55% (Global and Mail, December 7, 1999). Canada's long term inflation rate, taken as the difference between long term nominal and real return bonds, is about 2%. This provides for a real BC Government Bond yield of about (1.0655) ÷ (1.02) = 4.5% (rounded).

provincial government funding for services relative to Base Case level, the cost level, the effectiveness of the Lovaas treatment and the discount rate.

2.10 Potential Benefits of Lovaas Treatment Excluded from Cost-Benefit Analysis

You have advised that untreated autism and ASD can give rise to a number of social impacts and social costs, including the following:

(i). withdrawal of parent(s) from workforce (and reduction in labour income and GDP) in order to care for the child;

(ii). high incidence rate of marital breakdown;

(iii). significant numbers of homeless people;

(iv). high crime rates;

(v). high health care costs for parents (i.e., due to stress, migraines, depressions, etc.)

Lovaas intensive treatment has the potential to significantly improve the functioning of individuals with autism or ASD. As a result, Lovaas treatment can potentially reduce the above-noted social impacts and social costs.

At this time, the cost-benefit analysis has not attempted to quantify the potential social cost savings with Lovaas treatment for the above noted effects.

3.0 Cost-Benefit Results

3.1 Base Case

The preceding sections have outlined the approach to and estimation of net benefits or costs from the Lovaas treatment. This section presents cost-benefit results and tests the sensitivity of these results to varying key assumptions.

The cost-benefit analysis estimates net benefits (cost savings) from the Lovaas treatment to British Columbia. These include future cost savings and additional lifetime labour income.

Present values of per capita service costs under the "with" and "without" treatment scenarios are provided in Tables 4 and 5, attached. These are the building blocks for this cost-benefit analysis.

The Base Case results of the cost-benefit analysis are summarized in Table 6. Results are presented for the analysis using two measures of project efficiency: net benefits and internal rate-of-return with the former measure calculated at discount rates specified in the Law and Equity Act.

In the Base Case, net benefits per child from the Lovaas treatment in 2000 constant dollars are estimated to be $1,005,600 excluding wage income and $1,150,000 including wage income. The internal rate-of-return is estimated to be 42% excluding wage income[11].

3.2 Sensitivity Analysis

Sensitivity testing has been undertaken to examine the impact on net benefits from Lovaas treatment of changing assumptions made about certain variables. Results from altering various assumptions are provided in Tables 7 to 12, attached.

The sensitivity testing procedure has been to adjust each of the key assumptions made in the Base Case and then re-run the model to examine the impact of each change in assumptions on the net benefits from Lovaas treatment. It must be emphasized that the primary focus of the sensitivity analysis was to identify variables that could reduce project net benefits. Emphasis on scenarios that reduce net benefits should not be taken to mean that such scenarios are more probable than alternate scenarios which would increase net benefits. Indeed, numerous plausible scenarios could be developed that would result in higher net benefits than have been reported herein. The focus on "downward" sensitivity testing addresses the "robustness" of Base Case results under less favourable conditions.

Each of the sensitivity tests, with the exception of discount rate, has been discounted at the rates specified in the Law and Equity Act.

Sensitivity analyses in Tables 7 to 12 include the following:

(a) Cost Savings of Lovaas Treatment By Outcome Distributions (Table 7)

Table 7 calculates the cost savings (benefits) of Lovaas treatment by changes in the outcome distribution for the "with" treatment scenario, the "without" treatment scenario and both scenarios simultaneously.

[11] Including lifetime wage income only increases the internal rate-of-return by less than one percentage point, as such, all internal rate-of-returns calculated in this study are based on cost savings excluding wage income.

Variation in the "with" treatment outcome distributions explores the range in success rate of the treatment. Variation in the "without" treatment outcomes explores the range of condition that untreated individuals will likely experience. Combination sensitivities explore both issues simultaneously.

(b) Cost Savings of Lovaas Treatment By Variation in Lovaas Early Intervention Cost (Table 8)

Table 8 explores the sensitivity of cost savings and internal rate-of-return to increased/decreased investment in early intensive Lovaas treatment.

(c) Cost Savings of Lovaas Treatment By Variation in Government Funding Relative to The Base Case Level (Table 9)

Table 9 explores the sensitivity of cost savings and internal rate-of-return to increased/decreased government funding for services relative to the assumed level in Base Case.

(d) Cost Savings of Lovaas Treatment By Variation in Cost Percentage of Outcome 2 Relative to Outcome 3 (Table 10)

Table 10 explores the sensitivity of cost savings and internal rate-of-return to decreased/increased relative cost between Outcome 2 and Outcome 3 in both "with" and "without" treatment scenarios.

(e) Cost Savings of Lovaas Treatment By Variation in The Effectiveness of Lovaas Treatment (Table 11)

Table 11 explores the sensitivity of cost savings and internal rate-of-return to increased effectiveness of the Lovaas treatment in terms of service required following the treatment.

(f) Cost Savings of Lovaas Treatment By Variation in The Discount Rate (Table 12)

Table 12 explores the sensitivity of cost savings to various real discount rates.

3.3 Supplementary Estimates

Tables 13 to 20 in the Appendix provide supplementary information with regard to some fundamental estimates used in our cost-benefit analysis. Tables 13 and 14 provide multipliers used in the present value estimates of future cost of services (health and education) for male and female, respectively. Tables 15 to 20 provide earnings

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APPENDIX A
Index of Tables 1- 20

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Table 5 Present Value of Service Costs By Sex and Outcome - "Without" Lovaas Treatment Scenario

	Male					Female					Both Sex
Incidence Ratio	80%					20%					100%
Outcome 2: Semi-dependent											
		Starting Age	Ending Age	Multiplier	Present Value		Starting Age	Ending Age	Multiplier	Present Value	Present Value
Child Care											
Respite Services	2,590	3	19	12.282	31,810	2,590	3	19	12.289	31,829	31,814
Behaviour Support	5,810	3	19	12.282	71,358	5,810	3	19	12.289	71,401	71,367
Supported Childcare	6,720	3	12	7.732	51,962	6,720	3	12	7.734	51,975	51,965
Placement	22,680	3	19	12.282	278,556	22,680	3	19	12.289	278,720	278,589
Education											
Special	27,650	6	19	9.433	260,822	27,650	6	19	9.440	261,013	260,860
Adult Care											
Day Program	18,480	19	107	13.919	257,229	18,480	19	107	14.522	268,372	259,457
Residential (Family Home)	71,820	19	107	13.919	999,684	71,820	19	107	14.522	1,042,993	1,008,346
Wage, EI and Other Non-Wage Benefits	24,347	21	65	16.291	396,637	9,814	21	65	16.668	163,585	350,027
Total (Excluding Wage and Benefits)					1,951,422					2,006,303	1,962,398
Total (Including Wage and Benefits)					1,554,785					1,842,718	1,612,371
Outcome 3: Very Dependent											
	Annual Amount	Starting Age	Ending Age	Multiplier	Present Value	Annual Amount	Starting Age	Ending Age	Multiplier	Present Value	Present Value
Child Care											
Respite Services	3,700	3	19	12.282	45,443	3,700	3	19	12.289	45,470	45,449
Behaviour Support	8,300	3	19	12.282	101,941	8,300	3	19	12.289	102,001	101,953
Supported Childcare	9,600	3	18	11.699	112,306	9,600	3	18	11.704	112,361	112,317
Placement	32,400	3	19	12.282	397,937	32,400	3	19	12.289	398,172	397,984
Education											
Intensive Special	39,500	6	19	9.433	372,603	39,500	6	19	9.440	372,876	372,658
Adult Care											
Day Program	26,400	19	107	13.919	367,470	26,400	19	107	14.522	383,389	370,653
Residential (Group Home)	102,600	19	107	13.919	1,428,120	102,600	19	107	14.522	1,489,989	1,440,494
Wage, EI and Other Non-Wage Benefits	7,674	21	65	16.291	125,019	4,649	21	65	16.668	77,486	115,512
Total (Excluding Wage and Benefits)					2,825,820					2,904,259	2,841,507
Total (Including Wage and Benefits)					2,700,801					2,826,773	2,725,995

Table 12 Cost Savings of Lovaas Treatment By Variation in The Discount Rate

	Cost Savings	
Discount Rate	Excluding Wage	Including Wage
3.5%/2.5%*	1,006,551	1,149,983
4.5%	772,893	848,087
8.0%	369,768	395,612

Note: * These are the discount rates specified in the Law and Equity Act.
Shaded cells correspond to results in the Base Case.

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Table 13
Cost of Care Multipliers - Male
Assuming a Normal Life Expectancy

Age	Year	Annual Cost Of $1000 (1)	Mid-Year Calculated Survival Ratio (2)	Mid-Year Discount Factor @ 3.5%	Adjusted & Discounted Cost	Cumulative Adjusted & Discounted Cost	Multiplier: From Trial To Birthday	Multiplier: From Birthday To L.E.
3	2000 (3)	$1,000	0.9998	0.9829	983	$983	$0	26,201
4	2001	1,000	0.9995	0.9497	949	1,932	983	25,219
5	2002	1,000	0.9993	0.9176	917	2,849	1,932	24,269
6	2003	1,000	0.9991	0.8866	886	3,735	2,849	23,352
7	2004	1,000	0.9990	0.8566	856	4,590	3,735	22,467
8	2005	1,000	0.9988	0.8276	827	5,417	4,590	21,611
9	2006	1,000	0.9987	0.7996	799	6,216	5,417	20,784
10	2007	1,000	0.9986	0.7726	771	6,987	6,216	19,986
11	2008	1,000	0.9984	0.7465	745	7,732	6,987	19,214
12	2009	1,000	0.9982	0.7212	720	8,452	7,732	18,469
13	2010	1,000	0.9979	0.6968	695	9,148	8,452	17,749
14	2011	1,000	0.9975	0.6733	672	9,819	9,148	17,053
15	2012	1,000	0.9970	0.6505	649	10,468	9,819	16,382
16	2013	1,000	0.9962	0.6285	626	11,094	10,468	15,733
17	2014	1,000	0.9954	0.6072	604	11,699	11,094	15,107
18	2015	1,000	0.9944	0.5867	583	12,282	11,699	14,503
19	2016	1,000	0.9934	0.5669	563	12,845	12,282	13,919
20	2017	1,000	0.9924	0.5477	544	13,389	12,845	13,356
21	2018	1,000	0.9913	0.5292	525	13,913	13,389	12,813
22	2019	1,000	0.9902	0.5113	506	14,419	13,913	12,288
23	2020	1,000	0.9890	0.4940	489	14,908	14,419	11,782
24	2021	1,000	0.9879	0.4773	472	15,380	14,908	11,293
25	2022	1,000	0.9868	0.4611	455	15,835	15,380	10,822
26	2023	1,000	0.9856	0.4456	439	16,274	15,835	10,367
27	2024	1,000	0.9845	0.4305	424	16,698	16,274	9,928
28	2025	1,000	0.9834	0.4159	409	17,107	16,698	9,504
29	2026	1,000	0.9822	0.4019	395	17,501	17,107	9,095
30	2027	1,000	0.9810	0.3883	381	17,882	17,501	8,700
31	2028	1,000	0.9798	0.3751	368	18,250	17,882	8,319
32	2029	1,000	0.9785	0.3625	355	18,604	18,250	7,952
33	2030	1,000	0.9772	0.3502	342	18,947	18,604	7,597
34	2031	1,000	0.9759	0.3384	330	19,277	18,947	7,255
35	2032	1,000	0.9745	0.3269	319	19,595	19,277	6,924
36	2033	1,000	0.9730	0.3159	307	19,903	19,595	6,606
37	2034	1,000	0.9714	0.3052	296	20,199	19,903	6,298
38	2035	1,000	0.9698	0.2949	286	20,485	20,199	6,002
39	2036	1,000	0.9681	0.2849	276	20,761	20,485	5,716
40	2037	1,000	0.9663	0.2753	266	21,027	20,761	5,440
41	2038	1,000	0.9645	0.2659	257	21,283	21,027	5,174
42	2039	1,000	0.9625	0.2570	247	21,531	21,283	4,918
43	2040	1,000	0.9604	0.2483	238	21,769	21,531	4,670
44	2041	1,000	0.9581	0.2399	230	21,999	21,769	4,432
45	2042	1,000	0.9556	0.2318	221	22,221	21,999	4,202
46	2043	1,000	0.9528	0.2239	213	22,434	22,221	3,981

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Table 13
Cost of Care Multipliers - Male
Assuming a Normal Life Expectancy

Age	Year	Annual Cost Of $1000 (1)	Mid-Year Calculated Survival Ratio (2)	Mid-Year Discount Factor @ 3.5%	Adjusted & Discounted Cost	Cumulative Adjusted & Discounted Cost	Multiplier: From Trial To Birthday	Multiplier: From Birthday To L.E.
47	2044	1,000	0.9498	0.2163	205	22,639	22,434	3,767
48	2045	1,000	0.9464	0.2090	198	22,837	22,639	3,562
49	2046	1,000	0.9427	0.2020	190	23,028	22,837	3,364
50	2047	1,000	0.9387	0.1951	183	23,211	23,028	3,174
51	2048	1,000	0.9342	0.1885	176	23,387	23,211	2,991
52	2049	1,000	0.9293	0.1822	169	23,556	23,387	2,814
53	2050	1,000	0.9240	0.1760	163	23,719	23,556	2,645
54	2051	1,000	0.9180	0.1700	156	23,875	23,719	2,482
55	2052	1,000	0.9114	0.1643	150	24,025	23,875	2,326
56	2053	1,000	0.9042	0.1587	144	24,168	24,025	2,177
57	2054	1,000	0.8962	0.1534	137	24,306	24,168	2,033
58	2055	1,000	0.8874	0.1482	132	24,437	24,306	1,896
59	2056	1,000	0.8778	0.1432	126	24,563	24,437	1,764
60	2057	1,000	0.8671	0.1383	120	24,683	24,563	1,638
61	2058	1,000	0.8555	0.1337	114	24,797	24,683	1,518
62	2059	1,000	0.8428	0.1291	109	24,906	24,797	1,404
63	2060	1,000	0.8290	0.1248	103	25,009	24,906	1,295
64	2061	1,000	0.8142	0.1206	98	25,108	25,009	1,192
65	2062	1,000	0.7983	0.1165	93	25,201	25,108	1,094
66	2063	1,000	0.7813	0.1125	88	25,288	25,201	1,001
67	2064	1,000	0.7630	0.1087	83	25,371	25,288	913
68	2065	1,000	0.7435	0.1051	78	25,450	25,371	830
69	2066	1,000	0.7227	0.1015	73	25,523	25,450	752
70	2067	1,000	0.7005	0.0981	69	25,592	25,523	678
71	2068	1,000	0.6771	0.0948	64	25,656	25,592	610
72	2069	1,000	0.6522	0.0915	60	25,715	25,656	546
73	2070	1,000	0.6260	0.0885	55	25,771	25,715	486
74	2071	1,000	0.5983	0.0855	51	25,822	25,771	430
75	2072	1,000	0.5694	0.0826	47	25,869	25,822	379
76	2073	1,000	0.5393	0.0798	43	25,912	25,869	332
77	2074	1,000	0.5080	0.0771	39	25,951	25,912	289
78	2075	1,000	0.4756	0.0745	35	25,987	25,951	250
79	2076	1,000	0.4425	0.0720	32	26,018	25,987	215
80	2077	1,000	0.4087	0.0695	28	26,047	26,018	183
81	2078	1,000	0.3746	0.0672	25	26,072	26,047	154
82	2079	1,000	0.3404	0.0649	22	26,094	26,072	129
83	2080	1,000	0.3066	0.0627	19	26,113	26,094	107
84	2081	1,000	0.2734	0.0606	17	26,130	26,113	88
85	2082	1,000	0.2412	0.0585	14	26,144	26,130	71
86	2083	1,000	0.2104	0.0566	12	26,156	26,144	57
87	2084	1,000	0.1813	0.0546	10	26,166	26,156	45
88	2085	1,000	0.1542	0.0528	8	26,174	26,166	36
89	2086	1,000	0.1292	0.0510	7	26,181	26,174	27
90	2087	1,000	0.1067	0.0493	5	26,186	26,181	21

3155

Table 13
Cost of Care Multipliers - Male
Assuming a Normal Life Expectancy

Age	Year	Annual Cost Of $1000 (1)	Mid-Year Calculated Survival Ratio (2)	Mid-Year Discount Factor @ 3.5%	Adjusted & Discounted Cost	Cumulative Adjusted & Discounted Cost	Multiplier: From Trial To Birthday	Multiplier: From Birthday To L.E.
91	2088	1,000	0.0867	0.0476	4	26,190	26,186	16
92	2089	1,000	0.0692	0.0460	3	26,193	26,190	11
93	2090	1,000	0.0542	0.0445	2	26,196	26,193	8
94	2091	1,000	0.0416	0.0429	2	26,197	26,196	6
95	2092	1,000	0.0313	0.0415	1	26,199	26,197	4
96	2093	1,000	0.0230	0.0401	1	26,200	26,199	3
97	2094	1,000	0.0165	0.0387	1	26,200	26,200	2
98	2095	1,000	0.0115	0.0374	0	26,201	26,200	1
99	2096	1,000	0.0078	0.0362	0	26,201	26,201	1
100	2097	1,000	0.0051	0.0349	0	26,201	26,201	0
101	2098	1,000	0.0033	0.0338	0	26,201	26,201	0
102	2099	1,000	0.0020	0.0326	0	26,201	26,201	0
103	2100	1,000	0.0012	0.0315	0	26,201	26,201	0
104	2101	1,000	0.0007	0.0304	0	26,201	26,201	0
105	2102	1,000	0.0002	0.0294	0	26,201	26,201	0
106	2103	1,000	0.0002	0.0284	0	26,201	26,201	0
107	2104	1,000	0.0002	0.0275	0	26,201	26,201	0

Total: Trial to Age 55	**$23,875**
Total: Trial to Age 60	**$24,563**
Total: Trial to Age 65	**$25,108**
Total: Trial to Life Expectancy	**$26,201**
Age At Trial Date	**3.0**
Life Expectancy At Trial (Remaining Years)	**72.2**

(1) Constant 2000 Dollars.
(2) Based on Canadian Male Survival Rates
(3) Period From April 1, 2000 (Trial Date).

000069

Table 14
Cost of Care Multipliers - Female
Assuming a Normal Life Expectancy

Age	Year	Annual Cost Of $1000 (1)	Mid-Year Calculated Survival Ratio (2)	Mid-Year Discount Factor @ 3.5%	Adjusted & Discounted Cost	Cumulative Adjusted & Discounted Cost	Multiplier: From Trial To Birthday	Multiplier: From Birthday To L.E.
3	2000 (3)	$1,000	0.9999	0.9829	983	$983	$0	26,812
4	2001	1,000	0.9997	0.9497	949	1,932	983	25,829
5	2002	1,000	0.9995	0.9176	917	2,849	1,932	24,879
6	2003	1,000	0.9994	0.8866	886	3,735	2,849	23,962
7	2004	1,000	0.9992	0.8566	856	4,591	3,735	23,076
8	2005	1,000	0.9991	0.8276	827	5,418	4,591	22,220
9	2006	1,000	0.9990	0.7996	799	6,217	5,418	21,393
10	2007	1,000	0.9989	0.7726	772	6,989	6,217	20,595
11	2008	1,000	0.9988	0.7465	746	7,734	6,989	19,823
12	2009	1,000	0.9986	0.7212	720	8,455	7,734	19,077
13	2010	1,000	0.9985	0.6968	696	9,150	8,455	18,357
14	2011	1,000	0.9983	0.6733	672	9,822	9,150	17,661
15	2012	1,000	0.9980	0.6505	649	10,472	9,822	16,989
16	2013	1,000	0.9977	0.6285	627	11,099	10,472	16,340
17	2014	1,000	0.9974	0.6072	606	11,704	11,099	15,713
18	2015	1,000	0.9970	0.5867	585	12,289	11,704	15,107
19	2016	1,000	0.9966	0.5669	565	12,854	12,289	14,522
20	2017	1,000	0.9963	0.5477	546	13,400	12,854	13,957
21	2018	1,000	0.9959	0.5292	527	13,927	13,400	13,412
22	2019	1,000	0.9956	0.5113	509	14,436	13,927	12,885
23	2020	1,000	0.9952	0.4940	492	14,928	14,436	12,376
24	2021	1,000	0.9948	0.4773	475	15,402	14,928	11,884
25	2022	1,000	0.9944	0.4611	459	15,861	15,402	11,409
26	2023	1,000	0.9940	0.4456	443	16,304	15,861	10,951
27	2024	1,000	0.9936	0.4305	428	16,732	16,304	10,508
28	2025	1,000	0.9932	0.4159	413	17,145	16,732	10,080
29	2026	1,000	0.9928	0.4019	399	17,544	17,145	9,667
30	2027	1,000	0.9923	0.3883	385	17,929	17,544	9,268
31	2028	1,000	0.9918	0.3751	372	18,301	17,929	8,883
32	2029	1,000	0.9913	0.3625	359	18,660	18,301	8,511
33	2030	1,000	0.9908	0.3502	347	19,007	18,660	8,151
34	2031	1,000	0.9902	0.3384	335	19,342	19,007	7,804
35	2032	1,000	0.9896	0.3269	324	19,666	19,342	7,469
36	2033	1,000	0.9889	0.3159	312	19,978	19,666	7,146
37	2034	1,000	0.9881	0.3052	302	20,280	19,978	6,833
38	2035	1,000	0.9873	0.2949	291	20,571	20,280	6,532
39	2036	1,000	0.9864	0.2849	281	20,852	20,571	6,241
40	2037	1,000	0.9854	0.2753	271	21,123	20,852	5,960
41	2038	1,000	0.9844	0.2659	262	21,385	21,123	5,688
42	2039	1,000	0.9833	0.2570	253	21,638	21,385	5,427
43	2040	1,000	0.9821	0.2483	244	21,881	21,638	5,174
44	2041	1,000	0.9807	0.2399	235	22,117	21,881	4,930
45	2042	1,000	0.9791	0.2318	227	22,344	22,117	4,695
46	2043	1,000	0.9774	0.2239	219	22,562	22,344	4,468

Table 14
Cost of Care Multipliers - Female
Assuming a Normal Life Expectancy

Age	Year	Annual Cost Of $1000 (1)	Mid-Year Calculated Survival Ratio (2)	Mid-Year Discount Factor @ 3.5%	Adjusted & Discounted Cost	Cumulative Adjusted & Discounted Cost	Multiplier: From Trial To Birthday	Multiplier: From Birthday To L.E.
47	2044	1,000	0.9755	0.2163	211	22,773	22,562	4,249
48	2045	1,000	0.9734	0.2090	203	22,977	22,773	4,038
49	2046	1,000	0.9711	0.2020	196	23,173	22,977	3,835
50	2047	1,000	0.9686	0.1951	189	23,362	23,173	3,639
51	2048	1,000	0.9658	0.1885	182	23,544	23,362	3,450
52	2049	1,000	0.9628	0.1822	175	23,720	23,544	3,267
53	2050	1,000	0.9595	0.1760	169	23,888	23,720	3,092
54	2051	1,000	0.9558	0.1700	163	24,051	23,888	2,923
55	2052	1,000	0.9519	0.1643	156	24,207	24,051	2,761
56	2053	1,000	0.9476	0.1587	150	24,358	24,207	2,604
57	2054	1,000	0.9429	0.1534	145	24,502	24,358	2,454
58	2055	1,000	0.9377	0.1482	139	24,641	24,502	2,309
59	2056	1,000	0.9321	0.1432	133	24,775	24,641	2,170
60	2057	1,000	0.9261	0.1383	128	24,903	24,775	2,037
61	2058	1,000	0.9195	0.1337	123	25,026	24,903	1,909
62	2059	1,000	0.9123	0.1291	118	25,144	25,026	1,786
63	2060	1,000	0.9046	0.1248	113	25,256	25,144	1,668
64	2061	1,000	0.8962	0.1206	108	25,364	25,256	1,555
65	2062	1,000	0.8870	0.1165	103	25,468	25,364	1,447
66	2063	1,000	0.8772	0.1125	99	25,567	25,468	1,344
67	2064	1,000	0.8665	0.1087	94	25,661	25,567	1,245
68	2065	1,000	0.8549	0.1051	90	25,751	25,661	1,151
69	2066	1,000	0.8424	0.1015	86	25,836	25,751	1,061
70	2067	1,000	0.8289	0.0981	81	25,917	25,836	976
71	2068	1,000	0.8143	0.0948	77	25,994	25,917	894
72	2069	1,000	0.7985	0.0915	73	26,068	25,994	817
73	2070	1,000	0.7814	0.0885	69	26,137	26,068	744
74	2071	1,000	0.7627	0.0855	65	26,202	26,137	675
75	2072	1,000	0.7426	0.0826	61	26,263	26,202	610
76	2073	1,000	0.7208	0.0798	58	26,321	26,263	548
77	2074	1,000	0.6973	0.0771	54	26,374	26,321	491
78	2075	1,000	0.6719	0.0745	50	26,425	26,374	437
79	2076	1,000	0.6447	0.0720	46	26,471	26,425	387
80	2077	1,000	0.6157	0.0695	43	26,514	26,471	341
81	2078	1,000	0.5850	0.0672	39	26,553	26,514	298
82	2079	1,000	0.5525	0.0649	36	26,589	26,553	259
83	2080	1,000	0.5183	0.0627	32	26,621	26,589	223
84	2081	1,000	0.4827	0.0606	29	26,651	26,621	190
85	2082	1,000	0.4459	0.0585	26	26,677	26,651	161
86	2083	1,000	0.4082	0.0566	23	26,700	26,677	135
87	2084	1,000	0.3700	0.0546	20	26,720	26,700	112
88	2085	1,000	0.3318	0.0528	18	26,738	26,720	92
89	2086	1,000	0.2939	0.0510	15	26,753	26,738	74
90	2087	1,000	0.2569	0.0493	13	26,765	26,753	59

Table 14
Cost of Care Multipliers - Female
Assuming a Normal Life Expectancy

Age	Year	Annual Cost Of $1000 (1)	Mid-Year Calculated Survival Ratio (2)	Mid-Year Discount Factor @ 3.5%	Adjusted & Discounted Cost	Cumulative Adjusted & Discounted Cost	Multiplier: From Trial To Birthday	Multiplier: From Birthday To L.E.
91	2088	1,000	0.2214	0.0476	11	26,776	26,765	46
92	2089	1,000	0.1877	0.0460	9	26,784	26,776	36
93	2090	1,000	0.1565	0.0445	7	26,791	26,784	27
94	2091	1,000	0.1279	0.0429	5	26,797	26,791	20
95	2092	1,000	0.1025	0.0415	4	26,801	26,797	15
96	2093	1,000	0.0802	0.0401	3	26,804	26,801	11
97	2094	1,000	0.0613	0.0387	2	26,807	26,804	7
98	2095	1,000	0.0456	0.0374	2	26,808	26,807	5
99	2096	1,000	0.0329	0.0362	1	26,810	26,808	3
100	2097	1,000	0.0230	0.0349	1	26,810	26,810	2
101	2098	1,000	0.0155	0.0338	1	26,811	26,810	1
102	2099	1,000	0.0101	0.0326	0	26,811	26,811	1
103	2100	1,000	0.0063	0.0315	0	26,811	26,811	0
104	2101	1,000	0.0037	0.0304	0	26,811	26,811	0
105	2102	1,000	0.0013	0.0294	0	26,812	26,811	0
106	2103	1,000	0.0013	0.0284	0	26,812	26,812	0
107	2104	1,000	0.0013	0.0275	0	26,812	26,812	0

Total: Trial to Age 55	**$24,051**
Total: Trial to Age 60	**$24,775**
Total: Trial to Age 65	**$25,364**
Total: Trial to Life Expectancy	**$26,812**
Age At Trial Date	**3.0**
Life Expectancy At Trial (Remaining Years)	**78.4**

(1) Constant 2000 Dollars.
(2) Based on Canadian Female Survival Rates
(3) Period From April 1, 2000 (Trial Date).

000072

Table 15
Earnings Projection for the Average BC Male with All Levels of Schooling
Adjusted for: Labour Force Withdrawal (Average); Educ. Unempl. Rates; Educ. Part-Time Rates;
Labour Market Entry on July 1, 2016
Normal Life Expectancy for Mr.

Age	Year		Full-Time, Full-Year, Income	Labour Force Partpn Rate	Unem-ployment Rate	Part-Time Factor	LMC Adjusted Income	Canadian Male Survival Rates	Discount Rate (2) 2.50%	Fully Adjusted & Discounted Income	Cumulative Adjusted & Discounted Income
18	2015		0	75.4%	18.7%	45.4%	0	0.9947	0.6862	0	0
19	2016		11,042	79.7%	17.8%	38.1%	4,479	0.9937	0.6695	2,980	2,980
20	2017		23,166	84.0%	16.8%	30.8%	11,193	0.9926	0.6531	7,257	10,236
21	2018		24,309	88.3%	15.9%	23.6%	13,797	0.9916	0.6372	8,717	18,954
22	2019		25,710	91.6%	15.0%	17.8%	16,460	0.9904	0.6217	10,135	29,088
23	2020		27,885	92.0%	14.1%	16.6%	18,380	0.9893	0.6065	11,029	40,117
24	2021		30,059	92.3%	13.2%	15.3%	20,393	0.9882	0.5917	11,924	52,041
25	2022		32,234	92.7%	12.3%	14.1%	22,501	0.9870	0.5773	12,821	64,862
26	2023		34,409	93.0%	11.5%	12.8%	24,705	0.9859	0.5632	13,718	78,580
27	2024		36,367	93.3%	10.7%	11.7%	26,747	0.9848	0.5495	14,473	93,053
28	2025		37,679	93.3%	10.4%	10.9%	28,058	0.9837	0.5361	14,795	107,847
29	2026		38,992	93.4%	10.1%	10.2%	29,395	0.9825	0.5230	15,104	122,952
30	2027		40,304	93.4%	9.8%	9.4%	30,758	0.9813	0.5102	15,401	138,352
31	2028		41,616	93.5%	9.5%	8.6%	32,148	0.9801	0.4978	15,685	154,037
32	2029		42,906	93.5%	9.2%	8.1%	33,462	0.9789	0.4856	15,907	169,944
33	2030		44,130	93.4%	9.1%	8.0%	34,483	0.9776	0.4738	15,972	185,915
34	2031		45,353	93.4%	8.9%	8.0%	35,508	0.9762	0.4622	16,023	201,938
35	2032		46,577	93.4%	8.7%	8.0%	36,536	0.9748	0.4510	16,062	218,000
36	2033		47,800	93.3%	8.5%	8.0%	37,568	0.9733	0.4400	16,088	234,088
37	2034		48,891	93.3%	8.3%	8.0%	38,479	0.9718	0.4292	16,051	250,139
38	2035		49,584	93.1%	8.1%	7.9%	39,020	0.9702	0.4188	15,853	265,992
39	2036		50,278	92.8%	8.0%	7.9%	39,559	0.9685	0.4086	15,653	281,646
40	2037		50,971	92.6%	7.8%	7.9%	40,099	0.9668	0.3986	15,452	297,098
41	2038		51,665	92.4%	7.6%	7.9%	40,638	0.9649	0.3889	15,249	312,346
42	2039		52,293	92.2%	7.5%	7.8%	41,134	0.9630	0.3794	15,029	327,375
43	2040		52,727	91.9%	7.4%	7.5%	41,503	0.9609	0.3701	14,762	342,137
44	2041		53,160	91.5%	7.3%	7.2%	41,873	0.9587	0.3611	14,496	356,633
45	2042		53,594	91.2%	7.1%	6.9%	42,241	0.9562	0.3523	14,230	370,863
46	2043		54,027	90.8%	7.0%	6.6%	42,609	0.9535	0.3437	13,964	384,827
47	2044		54,530	90.5%	6.9%	6.4%	42,957	0.9505	0.3353	13,692	398,518
48	2045		55,240	90.1%	6.9%	6.6%	43,245	0.9472	0.3271	13,401	411,919
49	2046		55,951	89.7%	6.9%	6.8%	43,526	0.9436	0.3192	13,109	425,028
50	2047		56,661	89.2%	6.9%	6.9%	43,801	0.9397	0.3114	12,816	437,844
51	2048		57,371	88.8%	6.9%	7.1%	44,069	0.9353	0.3038	12,522	450,366
52	2049		57,665	88.0%	7.0%	7.2%	43,798	0.9306	0.2964	12,079	462,445
53	2050		56,715	85.8%	7.4%	7.0%	41,955	0.9253	0.2891	11,225	473,670
54	2051		55,764	83.7%	7.7%	6.7%	40,152	0.9195	0.2821	10,415	484,085
55	2052		54,814	81.5%	8.1%	6.5%	38,389	0.9131	0.2752	9,647	493,732
56	2053		53,864	79.4%	8.4%	6.3%	36,666	0.9060	0.2685	8,920	502,652
57	2054		52,965	76.3%	8.7%	6.1%	34,655	0.8982	0.2620	8,154	510,806
58	2055		52,221	70.8%	8.8%	5.9%	31,717	0.8896	0.2556	7,211	518,017
59	2056		51,478	65.2%	8.9%	5.6%	28,841	0.8802	0.2493	6,329	524,346
60	2057		50,734	59.6%	9.0%	5.4%	26,028	0.8698	0.2432	5,507	529,853
61	2058		49,990	54.0%	9.1%	5.1%	23,278	0.8584	0.2373	4,742	534,595
62	2059		49,313	48.4%	9.1%	5.5%	20,508	0.8459	0.2315	4,017	538,611
63	2060		48,835	42.6%	8.5%	7.6%	17,591	0.8325	0.2259	3,308	541,919
64	2061		48,357	36.8%	8.0%	9.7%	14,800	0.8179	0.2204	2,668	544,587
65	2062	(1)	11,850	33.2%	7.6%	10.9%	3,235	0.8023	0.2170	563	545,150
Average (2000 $)			$43,324	87.2%	9.3%	9.6%	$30,996	X Actuarial Mult.		17.587	$545,150

	Future Period
Adjusted Earnings	$545,150
Net Employment Insurance	$3,115
Non-Wage Benefits	$32,709
Subtotal	$580,974

(1) Period To Age 65 (April 1, 2062)
(2) Impact of 1% Real Wage Growth Allowance: 29.6%

3160

Table 16
Earnings Projection for the Average BC Male Working in Low Skill Occupations
Contingencies for the Average BC Male with a Grades 9-10 Education Level
Adjusted for: Labour Force Withdrawal (Average); Educ. Unempl. Rates; Educ. Part-Time Rates;
Labour Market Entry on July 1, 2018
Normal Life Expectancy for Mr.

Age	Year		Full-Time, Full-Year, Income	Labour Force Part'pn Rate	Unemployment Rate	Part-Time Factor	LMC Adjusted Income	Canadian Male Survival Rates	Discount Rate (2) 2.50%	Fully Adjusted & Discounted Income	Cumulative Adjusted & Discounted Income
18	2015		0	61.7%	29.7%	36.9%	0	0.9947	0.6862	0	0
19	2016		0	67.8%	30.4%	29.6%	0	0.9937	0.6695	0	0
20	2017		0	74.0%	31.0%	22.2%	0	0.9926	0.6531	0	0
21	2018		12,180	80.2%	31.6%	14.9%	5,682	0.9916	0.6372	3,590	3,590
22	2019		25,837	84.9%	31.7%	9.3%	13,576	0.9904	0.6217	8,359	11,949
23	2020		27,072	85.0%	30.2%	8.9%	14,645	0.9893	0.6065	8,787	20,736
24	2021		28,306	85.2%	28.6%	8.4%	15,757	0.9882	0.5917	9,213	29,950
25	2022		29,541	85.3%	27.1%	8.0%	16,912	0.9870	0.5773	9,637	39,586
26	2023		30,775	85.5%	25.5%	7.6%	18,112	0.9859	0.5632	10,057	49,643
27	2024		31,851	85.7%	24.2%	7.1%	19,235	0.9848	0.5495	10,408	60,051
28	2025		32,453	86.3%	23.6%	6.5%	20,021	0.9837	0.5361	10,557	70,608
29	2026		33,055	86.9%	23.0%	5.9%	20,829	0.9825	0.5230	10,703	81,311
30	2027		33,656	87.5%	22.4%	5.2%	21,660	0.9813	0.5102	10,845	92,157
31	2028		34,258	88.1%	21.8%	4.6%	22,513	0.9801	0.4978	10,984	103,140
32	2029		34,802	88.6%	21.1%	4.2%	23,282	0.9789	0.4856	11,068	114,208
33	2030		35,172	88.6%	20.3%	4.5%	23,740	0.9776	0.4738	10,996	125,204
34	2031		35,542	88.7%	19.4%	4.7%	24,202	0.9762	0.4622	10,921	136,125
35	2032		35,912	88.8%	18.5%	5.0%	24,667	0.9748	0.4510	10,844	146,968
36	2033		36,282	88.8%	17.7%	5.2%	25,135	0.9733	0.4400	10,764	157,732
37	2034		36,552	88.7%	17.0%	5.4%	25,439	0.9718	0.4292	10,611	168,344
38	2035		36,524	88.0%	17.0%	5.4%	25,241	0.9702	0.4188	10,255	178,599
39	2036		36,496	87.3%	17.0%	5.3%	25,044	0.9685	0.4086	9,910	188,508
40	2037		36,467	86.6%	16.9%	5.3%	24,846	0.9668	0.3986	9,574	198,083
41	2038		36,439	85.9%	16.9%	5.2%	24,648	0.9649	0.3889	9,249	207,332
42	2039		36,451	85.4%	16.8%	5.0%	24,603	0.9630	0.3794	8,989	216,321
43	2040		36,584	85.2%	16.4%	4.0%	25,014	0.9609	0.3701	8,897	225,218
44	2041		36,716	85.0%	16.0%	3.1%	25,429	0.9587	0.3611	8,803	234,021
45	2042		36,849	84.9%	15.6%	2.1%	25,847	0.9562	0.3523	8,707	242,728
46	2043		36,981	84.7%	15.2%	1.2%	26,268	0.9535	0.3437	8,609	251,337
47	2044		37,112	84.6%	14.7%	0.7%	26,594	0.9505	0.3353	8,476	259,813
48	2045		37,234	84.6%	14.2%	1.5%	26,620	0.9472	0.3271	8,249	268,062
49	2046		37,357	84.6%	13.7%	2.3%	26,643	0.9436	0.3192	8,024	276,086
50	2047		37,480	84.6%	13.2%	3.2%	26,663	0.9397	0.3114	7,801	283,888
51	2048		37,603	84.6%	12.6%	4.0%	26,679	0.9353	0.3038	7,581	291,468
52	2049		37,525	84.0%	12.3%	4.5%	26,421	0.9306	0.2964	7,287	298,755
53	2050		36,849	81.8%	12.3%	4.1%	25,359	0.9253	0.2891	6,785	305,540
54	2051		36,173	79.6%	12.3%	3.7%	24,314	0.9195	0.2821	6,306	311,846
55	2052		35,497	77.4%	12.3%	3.3%	23,285	0.9131	0.2752	5,851	317,698
56	2053		34,821	75.2%	12.4%	2.9%	22,273	0.9060	0.2685	5,418	323,116
57	2054		34,253	72.2%	12.4%	2.6%	21,070	0.8982	0.2620	4,958	328,074
58	2055		34,007	66.6%	12.6%	2.6%	19,272	0.8896	0.2556	4,382	332,455
59	2056		33,761	61.1%	12.8%	2.7%	17,504	0.8802	0.2493	3,841	336,296
60	2057		33,515	55.5%	12.9%	2.7%	15,766	0.8698	0.2432	3,336	339,632
61	2058		33,269	50.0%	13.1%	2.7%	14,058	0.8584	0.2373	2,864	342,496
62	2059		32,562	44.3%	13.1%	2.7%	12,215	0.8459	0.2315	2,392	344,888
63	2060		30,480	38.5%	12.5%	2.5%	9,998	0.8325	0.2259	1,880	346,768
64	2061		28,398	32.6%	11.9%	2.4%	7,955	0.8179	0.2204	1,434	348,202
65	2062	(1)	6,681	28.9%	11.6%	2.3%	1,669	0.8023	0.2170	291	348,492
Average (2000 $)			$33,759	82.5%	19.2%	4.9%	$21,392	X Actuarial Mult.		16,291	$348,492

	Future Period
Adjusted Earnings	$348,492
Net Employment Insurance	$27,235
Non-Wage Benefits	$20,910
Subtotal	$396,637

(1) Period To Age 65 (April 1, 2062)
(2) Impact of 1% Real Wage Growth Allowance: 29.4%

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Table 17
Earnings Projection for the Average BC Male Working at Minimum Wage
Contingencies for the Average BC Male with a Grades 9-10 Education Level
Adjusted for: Labour Force Withdrawal (Average); Educ. Unempl. Rates; Educ. Part-Time Rates;
Labour Market Entry on July 1, 2018
Normal Life Expectancy for Mr.

Age	Year		Full-Time, Full-Year, Income	Labour Force Part'pn Rate	Unem-ployment Rate	Part-Time Factor	LMC Adjusted Income	Canadian Male Survival Rates	Discount Rate (2) 2.50%	Fully Adjusted & Discounted Income	Cumulative Adjusted & Discounted Income
18	2015		0	61.7%	29.7%	36.9%	0	0.9947	0.6862	0	0
19	2016		0	67.8%	30.4%	29.6%	0	0.9937	0.6695	0	0
20	2017		0	74.0%	31.0%	22.2%	0	0.9926	0.6531	0	0
21	2018		7,170	80.2%	31.6%	14.9%	3,344	0.9916	0.6372	2,113	2,113
22	2019		14,300	84.9%	31.7%	9.3%	7,514	0.9904	0.6217	4,626	6,740
23	2020		14,300	85.0%	30.2%	8.9%	7,736	0.9893	0.6065	4,642	11,381
24	2021		14,300	85.2%	28.6%	8.4%	7,960	0.9882	0.5917	4,654	16,036
25	2022		14,300	85.3%	27.1%	8.0%	8,187	0.9870	0.5773	4,665	20,701
26	2023		14,300	85.5%	25.5%	7.6%	8,416	0.9859	0.5632	4,673	25,374
27	2024		14,300	85.7%	24.2%	7.1%	8,636	0.9848	0.5495	4,673	30,047
28	2025		14,300	86.3%	23.6%	6.5%	8,822	0.9837	0.5361	4,652	34,699
29	2026		14,300	86.9%	23.0%	5.9%	9,011	0.9825	0.5230	4,630	39,329
30	2027		14,300	87.5%	22.4%	5.2%	9,203	0.9813	0.5102	4,608	43,937
31	2028		14,300	88.1%	21.8%	4.6%	9,397	0.9801	0.4978	4,585	48,522
32	2029		14,300	88.6%	21.1%	4.2%	9,566	0.9789	0.4856	4,548	53,069
33	2030		14,300	88.6%	20.3%	4.5%	9,652	0.9776	0.4738	4,471	57,540
34	2031		14,300	88.7%	19.4%	4.7%	9,737	0.9762	0.4622	4,394	61,934
35	2032		14,300	88.8%	18.5%	5.0%	9,822	0.9748	0.4510	4,318	66,252
36	2033		14,300	88.8%	17.7%	5.2%	9,907	0.9733	0.4400	4,242	70,494
37	2034		14,300	88.7%	17.0%	5.4%	9,952	0.9718	0.4292	4,151	74,646
38	2035		14,300	88.0%	17.0%	5.4%	9,883	0.9702	0.4188	4,015	78,661
39	2036		14,300	87.3%	17.0%	5.3%	9,813	0.9685	0.4086	3,883	82,543
40	2037		14,300	86.6%	16.9%	5.3%	9,743	0.9668	0.3986	3,754	86,298
41	2038		14,300	85.9%	16.9%	5.2%	9,673	0.9649	0.3889	3,630	89,928
42	2039		14,300	85.4%	16.8%	5.0%	9,652	0.9630	0.3794	3,526	93,454
43	2040		14,300	85.2%	16.4%	4.0%	9,778	0.9609	0.3701	3,478	96,932
44	2041		14,300	85.0%	16.0%	3.1%	9,904	0.9587	0.3611	3,429	100,360
45	2042		14,300	84.9%	15.6%	2.1%	10,031	0.9562	0.3523	3,379	103,739
46	2043		14,300	84.7%	15.2%	1.2%	10,158	0.9535	0.3437	3,329	107,068
47	2044		14,300	84.6%	14.7%	0.7%	10,247	0.9505	0.3353	3,266	110,334
48	2045		14,300	84.6%	14.2%	1.5%	10,223	0.9472	0.3271	3,168	113,502
49	2046		14,300	84.6%	13.7%	2.3%	10,199	0.9436	0.3192	3,072	116,574
50	2047		14,300	84.6%	13.2%	3.2%	10,173	0.9397	0.3114	2,977	119,550
51	2048		14,300	84.6%	12.6%	4.0%	10,146	0.9353	0.3038	2,883	122,433
52	2049		14,300	84.0%	12.3%	4.5%	10,068	0.9306	0.2964	2,777	125,210
53	2050		14,300	81.8%	12.3%	4.1%	9,841	0.9253	0.2891	2,633	127,843
54	2051		14,300	79.6%	12.3%	3.7%	9,612	0.9195	0.2821	2,493	130,336
55	2052		14,300	77.4%	12.3%	3.3%	9,380	0.9131	0.2752	2,357	132,693
56	2053		14,300	75.2%	12.4%	2.9%	9,147	0.9060	0.2685	2,225	134,918
57	2054		14,300	72.2%	12.4%	2.6%	8,797	0.8982	0.2620	2,070	136,988
58	2055		14,300	66.6%	12.6%	2.6%	8,104	0.8896	0.2556	1,842	138,831
59	2056		14,300	61.1%	12.8%	2.7%	7,414	0.8802	0.2493	1,627	140,458
60	2057		14,300	55.5%	12.9%	2.7%	6,727	0.8698	0.2432	1,423	141,881
61	2058		14,300	50.0%	13.1%	2.7%	6,042	0.8584	0.2373	1,231	143,112
62	2059		14,300	44.3%	13.1%	2.7%	5,364	0.8459	0.2315	1,051	144,162
63	2060		14,300	38.5%	12.5%	2.5%	4,691	0.8325	0.2259	882	145,044
64	2061		14,300	32.6%	11.9%	2.4%	4,006	0.8179	0.2204	722	145,766
65	2062	(1)	3,526	28.9%	11.6%	2.3%	881	0.8023	0.2170	153	145,920
Average (2000 $)			$14,300	82.2%	19.7%	5.1%	$8,957	X Actuarial Mult.		16.291	$145,920

	Future Period
Adjusted Earnings	$145,920
Net Employment Insurance	$12,017
Non-Wage Benefits	$8,755
Subtotal	$166,692

(1) Period To Age 65 (April 1, 2062)
(2) Impact of 1% Real Wage Growth Allowance: 28.9%

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Table 18
Earnings Projection for the Average BC Female with All Levels of Schooling
Adjusted for: Labour Force Withdrawal (Average); Educ. Unempl. Rates; Educ. Part-Time Rates;
Labour Market Entry on July 1, 2016
Normal Life Expectancy for Ms.

Age	Year	Full-Time, Full-Year, Income	Labour Force Part'pn Rate	Unem-ployment Rate	Part-Time Factor	LMC Adjusted Income	Canadian Female Survival Rates	Discount Rate (2) 2.50%	Fully Adjusted & Discounted Income	Cumulative Adjusted & Discounted Income
18	2015	0	69.7%	16.2%	44.8%	0	0.9971	0.6862	0	0
19	2016	8,811	72.7%	14.9%	38.4%	3,355	0.9967	0.6695	2,239	2,239
20	2017	18,643	75.6%	13.7%	32.0%	8,279	0.9964	0.6531	5,388	7,627
21	2018	19,711	78.6%	12.5%	25.5%	10,099	0.9960	0.6372	6,409	14,036
22	2019	20,913	80.8%	11.4%	20.5%	11,900	0.9956	0.6217	7,366	21,402
23	2020	22,514	80.7%	11.0%	19.5%	13,005	0.9953	0.6065	7,850	29,252
24	2021	24,116	80.5%	10.6%	18.6%	14,138	0.9949	0.5917	8,323	37,575
25	2022	25,717	80.4%	10.2%	17.7%	15,300	0.9945	0.5773	8,784	46,359
26	2023	27,318	80.3%	9.8%	16.7%	16,491	0.9941	0.5632	9,233	55,593
27	2024	28,718	80.1%	9.5%	16.2%	17,465	0.9937	0.5495	9,536	65,129
28	2025	29,517	79.6%	9.4%	16.9%	17,705	0.9933	0.5361	9,428	74,556
29	2026	30,316	79.2%	9.4%	17.5%	17,934	0.9929	0.5230	9,313	83,869
30	2027	31,115	78.7%	9.3%	18.2%	18,152	0.9924	0.5102	9,192	93,061
31	2028	31,914	78.2%	9.3%	18.9%	18,358	0.9920	0.4978	9,065	102,126
32	2029	32,618	77.8%	9.2%	19.4%	18,585	0.9915	0.4856	8,949	111,074
33	2030	33,036	78.0%	8.9%	19.4%	18,906	0.9909	0.4738	8,876	119,951
34	2031	33,455	78.1%	8.6%	19.5%	19,229	0.9903	0.4622	8,803	128,753
35	2032	33,873	78.3%	8.4%	19.5%	19,555	0.9897	0.4510	8,728	137,481
36	2033	34,291	78.4%	8.1%	19.6%	19,882	0.9890	0.4400	8,652	146,133
37	2034	34,655	78.6%	7.8%	19.5%	20,226	0.9883	0.4292	8,580	154,713
38	2035	34,857	79.0%	7.6%	19.0%	20,617	0.9875	0.4188	8,526	163,239
39	2036	35,058	79.4%	7.3%	18.6%	21,014	0.9866	0.4086	8,470	171,709
40	2037	35,260	79.8%	7.0%	18.1%	21,416	0.9857	0.3986	8,414	180,123
41	2038	35,461	80.1%	6.7%	17.6%	21,823	0.9847	0.3889	8,356	188,479
42	2039	35,673	80.4%	6.5%	17.2%	22,199	0.9836	0.3794	8,284	196,763
43	2040	35,912	80.2%	6.5%	16.6%	22,467	0.9824	0.3701	8,169	204,932
44	2041	36,152	80.0%	6.4%	16.0%	22,735	0.9810	0.3611	8,054	212,986
45	2042	36,392	79.8%	6.3%	15.5%	23,004	0.9795	0.3523	7,938	220,924
46	2043	36,632	79.7%	6.2%	14.9%	23,274	0.9779	0.3437	7,822	228,746
47	2044	36,796	79.1%	6.2%	14.6%	23,337	0.9760	0.3353	7,637	236,384
48	2045	36,736	77.6%	6.3%	14.7%	22,778	0.9739	0.3271	7,257	243,641
49	2046	36,676	76.1%	6.4%	14.9%	22,223	0.9717	0.3192	6,892	250,533
50	2047	36,616	74.5%	6.5%	15.1%	21,673	0.9692	0.3114	6,541	257,073
51	2048	36,556	73.0%	6.6%	15.3%	21,127	0.9665	0.3038	6,203	263,276
52	2049	36,392	71.0%	6.7%	15.3%	20,410	0.9635	0.2964	5,828	269,105
53	2050	35,921	67.4%	6.8%	15.0%	19,182	0.9603	0.2891	5,326	274,431
54	2051	35,450	63.9%	6.9%	14.7%	17,975	0.9567	0.2821	4,851	279,282
55	2052	34,979	60.3%	7.1%	14.4%	16,788	0.9529	0.2752	4,403	283,684
56	2053	34,508	56.8%	7.2%	14.1%	15,623	0.9486	0.2685	3,979	287,664
57	2054	34,002	52.9%	7.3%	13.8%	14,379	0.9440	0.2620	3,556	291,220
58	2055	33,391	48.2%	7.4%	13.6%	12,869	0.9390	0.2556	3,088	294,308
59	2056	32,781	43.5%	7.5%	13.5%	11,402	0.9335	0.2493	2,654	296,962
60	2057	32,171	38.7%	7.6%	13.3%	9,979	0.9276	0.2432	2,252	299,213
61	2058	31,560	34.0%	7.7%	13.1%	8,599	0.9211	0.2373	1,880	301,093
62	2059	30,872	29.4%	7.8%	12.8%	7,302	0.9141	0.2315	1,546	302,638
63	2060	29,951	25.4%	7.7%	12.1%	6,164	0.9065	0.2259	1,262	303,901
64	2061	29,030	21.3%	7.6%	11.3%	5,065	0.8983	0.2204	1,003	304,903
65	2062 (1)	7,016	18.8%	7.6%	10.9%	1,085	0.8893	0.2170	209	305,113
Average (2000 $)		$30,832	73.2%	8.4%	17.9%	$16,979	X Actuarial Mult.		17,970	$305,113

	Future Period
Adjusted Earnings	$305,113
Net Employment Insurance	$418
Non-Wage Benefits	$18,307
Subtotal	$323,837

(1) Period To Age 65 (April 1, 2062)
(2) Impact of 1% Real Wage Growth Allowance: 28.6%

000076

Table 19
Earnings Projection for the Average BC Female Working in Low Skill Occupations
Contingencies for the Average BC Female with a Grades 9-10 Education Level
Adjusted for: Labour Force Withdrawal (Average); Educ. Unempl. Rates; Educ. Part-Time Rates;
Labour Market Entry on July 1, 2018
Normal Life Expectancy for Ms.

Age	Year		Full-Time, Full-Year, Income	Labour Force Part'pn Rate	Unem-ployment Rate	Part-Time Factor	LMC Adjusted Income	Canadian Female Survival Rates	Discount Rate (2) 2.50%	Fully Adjusted & Discounted Income	Cumulative Adjusted & Discounted Income
18	2015		0	49.2%	29.8%	57.6%	0	0.9971	0.6862	0	0
19	2016		0	50.9%	30.2%	47.7%	0	0.9967	0.6695	0	0
20	2017		0	52.7%	30.6%	37.8%	0	0.9964	0.6531	0	0
21	2018		8,102	54.5%	31.0%	27.9%	2,196	0.9960	0.6372	1,394	1,394
22	2019		17,202	55.9%	31.0%	20.3%	5,285	0.9956	0.6217	3,271	4,665
23	2020		18,132	56.1%	29.8%	19.6%	5,741	0.9953	0.6065	3,466	8,131
24	2021		19,063	56.3%	28.5%	18.9%	6,218	0.9949	0.5917	3,660	11,791
25	2022		19,993	56.5%	27.2%	18.2%	6,715	0.9945	0.5773	3,855	15,646
26	2023		20,924	56.6%	26.0%	17.5%	7,233	0.9941	0.5632	4,050	19,696
27	2024		21,676	56.9%	25.0%	17.1%	7,666	0.9937	0.5495	4,186	23,882
28	2025		21,896	57.4%	24.9%	17.5%	7,785	0.9933	0.5361	4,145	28,027
29	2026		22,117	57.9%	24.7%	18.0%	7,904	0.9929	0.5230	4,104	32,131
30	2027		22,337	58.3%	24.6%	18.4%	8,023	0.9924	0.5102	4,063	36,194
31	2028		22,558	58.8%	24.5%	18.8%	8,142	0.9920	0.4978	4,021	40,214
32	2029		22,762	59.4%	24.1%	18.9%	8,324	0.9915	0.4856	4,008	44,222
33	2030		22,918	60.2%	23.0%	18.1%	8,696	0.9909	0.4738	4,083	48,305
34	2031		23,074	61.1%	22.0%	17.4%	9,081	0.9903	0.4622	4,157	52,462
35	2032		23,229	61.9%	20.9%	16.6%	9,478	0.9897	0.4510	4,230	56,692
36	2033		23,385	62.7%	19.9%	15.9%	9,887	0.9890	0.4400	4,302	60,994
37	2034		23,538	63.4%	18.9%	15.1%	10,275	0.9883	0.4292	4,359	65,353
38	2035		23,684	63.8%	18.3%	14.4%	10,567	0.9875	0.4188	4,370	69,723
39	2036		23,830	64.2%	17.7%	13.7%	10,866	0.9866	0.4086	4,380	74,102
40	2037		23,976	64.6%	17.1%	13.0%	11,171	0.9857	0.3986	4,389	78,491
41	2038		24,122	65.0%	16.4%	12.3%	11,482	0.9847	0.3889	4,396	82,887
42	2039		24,225	65.2%	15.7%	11.9%	11,724	0.9836	0.3794	4,375	87,262
43	2040		24,200	64.8%	14.6%	12.3%	11,741	0.9824	0.3701	4,269	91,531
44	2041		24,174	64.3%	13.4%	12.7%	11,756	0.9810	0.3611	4,164	95,696
45	2042		24,148	63.9%	12.3%	13.1%	11,767	0.9795	0.3523	4,061	99,757
46	2043		24,122	63.5%	11.2%	13.5%	11,776	0.9779	0.3437	3,958	103,714
47	2044		24,106	62.8%	10.3%	13.7%	11,719	0.9760	0.3353	3,835	107,550
48	2045		24,116	61.2%	10.1%	13.6%	11,470	0.9739	0.3271	3,654	111,204
49	2046		24,127	59.7%	10.0%	13.4%	11,218	0.9717	0.3192	3,479	114,683
50	2047		24,138	58.1%	9.8%	13.3%	10,964	0.9692	0.3114	3,309	117,992
51	2048		24,148	56.5%	9.6%	13.2%	10,708	0.9665	0.3038	3,144	121,136
52	2049		24,172	54.7%	9.5%	12.9%	10,424	0.9635	0.2964	2,977	124,113
53	2050		24,235	52.3%	9.4%	12.4%	10,059	0.9603	0.2891	2,793	126,906
54	2051		24,298	49.9%	9.4%	11.8%	9,685	0.9567	0.2821	2,614	129,520
55	2052		24,362	47.5%	9.3%	11.3%	9,303	0.9529	0.2752	2,440	131,960
56	2053		24,425	45.1%	9.2%	10.8%	8,913	0.9486	0.2685	2,270	134,230
57	2054		24,381	42.2%	9.2%	10.1%	8,402	0.9440	0.2620	2,078	136,308
58	2055		24,019	38.0%	9.1%	9.0%	7,553	0.9390	0.2556	1,813	138,120
59	2056		23,656	33.9%	9.0%	8.0%	6,707	0.9335	0.2493	1,561	139,681
60	2057		23,294	29.7%	9.0%	6.9%	5,863	0.9276	0.2432	1,323	141,004
61	2058		22,931	25.5%	8.9%	5.8%	5,022	0.9211	0.2373	1,098	142,102
62	2059		22,449	21.6%	8.7%	5.3%	4,201	0.9141	0.2315	889	142,991
63	2060		21,609	18.6%	8.0%	6.3%	3,456	0.9065	0.2259	708	143,699
64	2061		20,769	15.5%	7.4%	7.3%	2,760	0.8983	0.2204	546	144,245
65	2062	(1)	4,992	13.6%	7.0%	8.0%	580	0.8893	0.2170	112	144,357
Average (2000 $)			$22,458	55.8%	18.7%	15.0%	$8,661	X Actuarial Mult.		16.668	$144,357

	Future Period
Adjusted Earnings	$144,357
Net Employment Insurance	$10,566
Non-Wage Benefits	$8,661
Subtotal	$163,585

(1) Period To Age 65 (April 1, 2062)
(2) Impact of 1% Real Wage Growth Allowance: 29.6%

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Table 20
Earnings Projection for the Average BC Female Working in Low Skill Occupations
Contingencies for the Average BC Female with a Grades 9-10 Education Level
Adjusted for: Labour Force Withdrawal (Average); Educ. Unempl. Rates; Educ. Part-Time Rates;
Labour Market Entry on July 1, 2018
Normal Life Expectancy for Ms.

Age	Year		Full-Time, Full-Year, Income	Labour Force Part'pn Rate	Unem-ployment Rate	Part-Time Factor	LMC Adjusted Income	Canadian Female Survival Rates	Discount Rate (2) 2.50%	Fully Adjusted & Discounted Income	Cumulative Adjusted & Discounted Income
18	2015		0	49.2%	29.8%	57.6%	0	0.9971	0.6862	0	0
19	2016		0	50.9%	30.2%	47.7%	0	0.9967	0.6695	0	0
20	2017		0	52.7%	30.6%	37.8%	0	0.9964	0.6531	0	0
21	2018		8,102	54.5%	31.0%	27.9%	2,196	0.9960	0.6372	1,394	1,394
22	2019		17,202	55.9%	31.0%	20.3%	5,285	0.9956	0.6217	3,271	4,665
23	2020		18,132	56.1%	29.8%	19.6%	5,741	0.9953	0.6065	3,466	8,131
24	2021		19,063	56.3%	28.5%	18.9%	6,218	0.9949	0.5917	3,660	11,791
25	2022		19,993	56.5%	27.2%	18.2%	6,715	0.9945	0.5773	3,855	15,646
26	2023		20,924	56.6%	26.0%	17.5%	7,233	0.9941	0.5632	4,050	19,696
27	2024		21,676	56.9%	25.0%	17.1%	7,666	0.9937	0.5495	4,186	23,882
28	2025		21,896	57.4%	24.9%	17.5%	7,785	0.9933	0.5361	4,145	28,027
29	2026		22,117	57.9%	24.7%	18.0%	7,904	0.9929	0.5230	4,104	32,131
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(1) Period To Age 65 (April 1, 2062)
(2) Impact of 1% Real Wage Growth Allowance: 29.6%

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Ex. C to Affidavit of Douglas G. Hildebrand dataed March 23, 2000

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COLUMBIA PACIFIC CONSULTING

Management and Economic Consultants
1550-650 West Georgia Street
Box 11561, Vancouver Centre
Vancouver, BC V6B 4N8
E-Mail: mail@cpconsulting.com
Website: www.cpconsulting.com
Tel: (604) 689-0025
Fax: (604) 689-7957

By hand

March 17, 2000
Our file: 215199
Your file 8777-96618

This is Exhibit "C" referred to in the affidavit of Douglas G. Hildebrand sworn before me, at Vancouver BC this 23rd day of March 20 00
A COMMISSIONER FOR TAKING AFFIDAVITS FOR BRITISH COLUMBIA

Harper Grey Easton
Barristers and Solicitors
3100 - 650 West Georgia St.
P.O. Box 11504
Vancouver , B.C.
V6B 4P7

Attention of Ms. Birgitta von Krosigk

Dear Sirs/Mesdames:

Re: Cost Benefit Analysis of Lovaas Treatment

Further to our preliminary report of December 7, 1999, "Cost-Benefit Analysis of Lovaas Treatment for Autism and Autism Spectrum Disorder (ASD)", we respond to the critique of our report attached to the Affidavit of Ms. Carolyn Green (February 2000).

The critique is entitled "Critical Appraisal of Submitted Cost-Benefit Models of 'Lovaas' Early Intensive Behavioural Intervention for Autism" (February, 2000) and is co-authored by Ms. Carolyn Green, Dr. Ken Bassett and Dr. Arminée Kazanjian, all of the B.C. Office of Health Technology Assessment (BCOHTA), University of British Columbia. Hereinafter we refer to the critique as Green et al for identification purposes.

We commence our reply with general comments, followed by specific comments on each section of the critique in chronological order (i.e., starting at page 1 through to page 18).

I. General Comments in Reply

1. As economists, we are in no position to comment on the medical/health effectiveness of Lovaas Treatment per se – we leave that issue to the medical specialists. Our cost-benefit analysis (CBA) does, however, explore a wide

range in effectiveness outcomes through sensitivity analysis. Our sensitivity testing was deliberately skewed towards the "downside" (i.e., scenarios which reduced net benefits relative to "most likely" or base case assumptions) in order to address the "robustness" of results.

2. Green et al maintain that our range in effectiveness assumptions should have been extended even further in the less favourable direction. For example, Green et al suggest that some proportion of children with autism should be assumed normal "without Lovaas", and that greater-than-10% of children "with Lovaas" should be assumed very dependent.[1] Our computer-based CBA model can be easily applied to explore even less favourable effectiveness assumptions. The suggestion by Green et al of zero difference in effectiveness between the "with Lovaas" and "without Lovaas" is, however, extreme. The result of such a scenario is self-evident, but the effectiveness assumption is contrary to the Jacobsen et al and Lovaas research which we were directed to assume within a British Columbia context.

3. Our cost assumptions were developed largely from review of material provided by the provincial government and by counsel. Variation in cost assumptions was also explored in sensitivity testing and we welcome any suggestions regarding alternate cost assumptions. We note that Green et al did not provide any comments on specific cost levels to assume.

4. To assist reviewers of our preliminary CBA, we will provide under separate letter two items: (1) a description of cost information from various sources which can be compared to our cost assumptions and which therefore provides context; and (2) CBA results for alternate effectiveness scenarios which reflect Green et al's comments.

5. We agree with Green et al that Drummond et al provide an excellent framework for economic evaluation techniques. As indicated below, we basically find Drummond et al to be supportive of our analysis, as distinct from the misinterpretations provided by Green et al.

II. Executive Summary Section (pages 1-2)

1. Green et al suggest the effectiveness assumptions are skewed in favour of Lovaas treatment. As Green et al appear to substantially dispute the

[1] *Green et al indicate at page 1 that our CBA assumed an effectiveness range of 40% to 80% for the "very dependent" state without Lovaas treatment. This is incorrect. The 40% to 80% range pertained to the "semi-dependent" state without Lovaas treatment. The range for the "very dependent" state without Lovaas treatment was 20% to 60%.*

effectiveness of Lovaas treatment, this comment is to be expected. Effectiveness of treatment is a matter for medical/health specialists.

2. Green et al are critical of the cost assumptions and suggest costs should be based on actual measurements of functioning autism treatment programs. We note, however, that there already exists extensive cost information related to special needs individuals (including autistic persons) in British Columbia (moderately dependent, heavily dependent) in terms of their health, education and residential care requirements.

III. Section One-Introduction (Pages 3-5)

1.0 Economic Modelling Bias

1.1 We agree with the comments about models, potential for bias and the excerpt from Sheldon. Clinical trials are required, for example, prior to approval and commercialisation of a new drug treatment. The purpose of the Lovaas CBA (preliminary report) is to explore the treatment's potential economic merit vis à vis the existing approach to the disorder. The preliminary CBA report strikes us as appropriate within such a context.

2.0 Appropriateness of CBA Model

2.1 It is true that a cost-benefit study attempts to quantify in monetary terms the costs and benefits associated with each alternative. As Drummond et al outline in Chapter 7, the benefits of a health treatment option typically include the following:

(a) future health care costs avoided (or saved);
(b) increased productive output due to improved health status;
(c) intangible benefits which are the value of improved health per se to the individual consumer of the health care option.

2.2 Our CBA study quantified in monetary terms both cost saving (a) and wage income (b) benefits. This approach is consistent with Drummond et al's description of the Human Capital Approach (Section 7.2.1). Our method is also conservative in that no attempt was made to monetize intangible benefits of improved health (c), which, of course, would have increased the net benefits of Lovaas treatment in each scenario examined. Our decision not to monetize intangible benefits of improved health relates to the potential for double counting with (a) and (b), which Drummond et al discusses in Section 7.3. Hence our CBA restricts the monetary measure of willingness-to-pay (WTP) benefits to avoided costs and increased income productivity. Given

the double counting issue just noted and the very contentious issue of WTP approaches to monetizing intangible benefits of improved health (contingent valuation approach), our approach strikes us as appropriate in the context.[2]

2.3 Drummond et al also distinguish the typical assessment in which the costs and health benefits of the proposed option both increase, versus the atypical assessment (dominant case) in which costs of the proposed option are lower and health benefits increase (win-win). At page 142, Drummond et al say it is unnecessary to quantify health benefits in the dominant (win-win) case, for obvious reasons. Our CBA of Lovaas treatment was a dominant case – i.e., costs were lower and health benefits greater than the "no Lovaas" approach.

3.0 B.C. Government's Benefit-Cost Analysis Guidelines

3.1 Geen et al's comments on the B.C. Government's CBA guidelines are misplaced. The B.C. guidelines on CBA are consistent with Drummond et al's discussion on CBA. The B.C. Government's guidelines are reflective of guidelines published by the federal government and international lending institutions. Whilst the guidelines are not specifically targeted to health care, the concepts are generally accepted by economists.

IV. Sections Two-Three: Appraisal Methodology and Results (pages 6-11)

1.0 Appraisal Checklist

1.1 We have no difficulty with this 10-point checklist.

2.0 Well-Defined Question Posed? (#1)

2.1 We were asked to address a very specific question in our CBA: the costs and benefits of Lovaas treatment versus no Lovaas treatment. The no Lovaas treatment case was, of course, intended to reflect the *status quo* (or existing) approach to the disorder. We were not asked to address a range of other alternatives. The fact that other alternatives were not addressed does not invalidate the CBA methodology or results.

2.2 Green et al suggest alternatives should be compared to the "do nothing" option. This is appropriate when the "do nothing" option is viable (e.g., in a case evaluating alternate drug treatments where the consumer can choose the

[2] / *Another conservative feature of our CBA relates to benefit (b) increased productive output. We restricted our monetized benefit to wage earnings. As Drummond et al point out at page 210, a monetized benefit could be added to reflect increased productivity of household services. We frequently monetize the value of household services activity in serious personal injury cases along the lines suggested by Drummond et al (e.g., hourly replacement cost x number of hours of productive household work). In our CBA, however, we have not included the value of increased productive household work.*

"do nothing" option, i.e., it is feasible). In the case of autism, statutory or institutional mitigation comes into play. The "do nothing" case assumes that our society is prepared to "do nothing" for significantly handicapped individuals. Our comparative case for Lovaas treatment is the status quo scenario (without Lovaas) which involves the social costs of dealing with handicapped individuals. This approach appears to satisfy the intent of Drummond et al's references to "do nothing" and status quo in their Chapter 2.

3.0 Competing Alternatives (#2)

3.1 Green et al are critical of the lack of detail underlying the service requirements and costs of the two options addressed. Further detail will be provided under separate letter.

3.2 Green et al repeat the "textbook" need for the "do nothing" case as a benchmark. See response at 2.2.

4.0 Effectiveness Established? (#3)

4.1 Our CBA addressed a broad range of possible effectiveness outcomes for the "with Lovaas" and status quo cases. We also indicated that our base case (most likely) assumptions were drawn from Jacobsen et al and Lovaas research. Beyond that, we leave it to the medical/health specialists to address effectiveness issues.

5.0 All Costs/Consequences Identified (#4)

5.1 Further detail is requested and will be provided.

6.0 Costs/Consequences Measured Accurately in Physical Units (#5)

6.1 Issues raised concerning cost reliability, cost detail and range of effectiveness assumptions have been dealt with above.

6.2 Green et al suggest costs and consequences should be integrated into the measure of cost per quality-adjusted life years (QUALs). In essence, they suggest an alternate methodology to CBA be applied, namely cost-utility analysis (CUA) which is a variant of cost-effectiveness analysis (CEA). Under CUA/CEA methods, the consequences (health benefits) of a treatment option are not expressed in monetary terms, but are dealt with in physical units such as QUALs. The cost per QUALs are computed for each option and compared to establish the cost per QUALs gained.

6.3 We agree with Drummond et al and Green et al that CUA and CEA analyses can be useful and complementary to CBA in evaluating project options.

However, in the context of our evaluation, calculating the cost per QUAL has the following limitations:

- As Drummond et al say (see page 142), there is no need to bother calculating QUALs if it is a dominant assessment (i.e., lower cost and more effective – win/win case) such as our assessment. Calculation of QUALs in this context simply makes the dominant option even more attractive.
- Calculation of QUALs is obviously much more relevant to evaluating treatment options involving differences in life expectancy; in our assessment, life expectancy is assumed to be the same for both options.

6.4 As an exercise and for purposes of illustration only, we have calculated the cost per QUALs following the method set out by Drummond et al in Chapter 6. We re-express the discounted cost of "without" and "with" Lovaas treatment (excluding wage income) on a cost per QUALs basis. The assumptions are as follows:

- Weights for normal, semi-dependent and very dependent states are set at 1.0, 0.85 and 0.65 respectively; these are arbitrary weights, but generally reflect the data in Table 6.7 of Drummond et al;
- The expected weight for the "with" and "without" Lovaas treatment cases are calculated at 0.89 and 0.75 respectively assuming our Base Case effectiveness outcomes;
- From Tables 13 and 14 of our report, the discounted value of life-years (unadjusted for quality) is about 26.3 at 3.5% real assuming an 80/20 incidence rate for males/females;
- discounted QUALs are calculated, therefore, at about 23.4 and 19.7 for the "with" and "without" Lovaas treatment cases respectively;
- on this basis the cost per QUALs gained is estimated as follows (per child):

Scenario	Discounted Cost	Discounted Cost per QUALs
(a) Without Lovaas	$2.4 million	$121,800
(b) With Lovaas	$1.4 million	$ 59,800
(c) Cost Saving	$1.0 million	$ 62,000 gained
(d) Ratio (a) to (b)	1.714	2.037

The above illustration indicates that inclusion of health benefits as measured by QUALs increases the relative merit of Lovaas treatment. This is evident from the benefit/cost ratio (ratio of avoided cost to cost) which increases from about 1.7 (unadjusted for life quality) to 2.0 (adjusted for life quality). In conclusion on this point, we note that there is contention amongst economists as to quantification of

QUALs (i.e., just as there is in valuing an individual's health benefits in monetary terms) as noted by Drummond et al in Chapter 6.

7.0 Costs/Consequences Valued Credibly (#6)

7.1 Issues already addressed.

8.0 Costs/Consequences Adjusted for Differential Timing (#7)

8.1 No apparent disagreement on discounting.

9.0 Incremental Analysis Done? (#8)

9.1 Issues already addressed.

10.0 Allowance Made for Uncertainty (#9)

10.1 Issues already addressed.

11.0 Include All Issues of Concern (#10)

11.1 Our CBA was a focussed assessment. Clearly there are issues of concern for many stakeholders that go beyond this narrowly focussed analysis. This does not, however, invalidate the study's findings.

V. Summary and Conclusions (pages 17-18)

The points made in summary and conclusion have already been addressed. As stated above, alternate effectiveness assumptions can be made and CBA results efficiently calculated with our computerised model. Further detail on costs can be provided, and CBA results can be generated with alternate cost assumptions as well. Other criticisms advanced by Green et al stem from their literal, textbook interpretations of Drummond et al, which, we have pointed out, have frequently been misinterpretations.

This concludes our reply.

Yours very truly,

Douglas G. Hildebrand
Director

3708
Ex. D to Affidavit of Douglas G. Hildebrand dated March 23, 2000

3172

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Delivered by Hand

March 20, 2000

This is Exhibit" D "referred to in the affidavit of Douglas G. Hildebrand sworn before me, at Vancouver BC this 23rd day of March 20 00
A COMMISSIONER FOR TAKING AFFIDAVITS FOR BRITISH COLUMBIA

Our File: 215199
Your File: 8777-96618

Harper Grey Easton
Barristers and Solicitors
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P. O. Box 11504
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Attention of Ms. Birgitta von Krosigk

Dear Sirs/Mesdames:

Re: Cost Benefit Analysis of Lovaas Treatment

Further to our letter to you dated March 17, 2000, we respond to issues in Green et al's (February 2000) critique which we did not address in the earlier letter, namely, (1) cost information and (2) CBA results for alternative effectiveness scenarios which reflect Green et al's comment.

1.0 Description of Cost Information

In Sections 2.2 and 2.3 of our preliminary report, we briefly introduced the broad cost categories and mentioned principal sources of data used in the CBA. In the attached Data Appendix, we provide some further information with regard to cost derivation and data sources.

As indicated on Page 6 of our preliminary report, except for Lovaas early intervention and costs for Outcome 1 in the "with" treatment scenario, service costs for Outcome 2 are assumed to be 70% of those for Outcome 3. Hence, our descriptions in the Data Appendix focus on the costs for Outcome 3 unless otherwise noted.

2.0 CBA Results for Alternative Effectiveness Scenarios Based on Green et al's Comments

Green et al maintain that our range in effectiveness assumptions should have been extended further in the less favourable direction. For example, Green et al suggest that greater-than-10% of children "with Lovaas" should be assumed very dependent and that some proportion of children with autism should be assumed normal "without Lovaas". As indicated in our letter of March 17, 2000, as economists, we are not in a position to comment on the effectiveness of Lovaas treatment. In our preliminary analysis, we applied a computer model to explore the most likely scenarios based on Jacobson (1996)[1]. Our model can certainly be used to investigate any other possible scenarios, such as those suggested by Green et al. Examining these alternative scenarios, however, does not reflect our opinion with regard to the likelihood of their occurrence, an issue which can only be addressed by medical and health specialists.

In this section, we explore the impact on net benefits from Lovaas treatment by considering various alternative effectiveness scenarios. To achieve this, we take a three-step approach:

> Step 1: All else equal (to what we assumed in the preliminary report), we increase the proportion of children "with" Lovaas treatment but remain very dependent;
>
> Step 2: All else equal, we increase the proportion of children "without" Lovaas treatment but achieve normal functioning;
>
> Step 3: We simultaneously increase both the proportion of children "with" treatment but remain very dependent and the proportion of children "without" Lovaas treatment but achieve normal functioning.

Before we conduct step 1, we need to make some supplementary cost assumptions to facilitate our analysis.

➢ Cost Assumptions for Children "Without" Lovass Achieving Normal Functioning

On Page 9 of Green et al's critique, it was pointed out that "as many as 20% of children labelled 'autistic' achieved education and employment without the significant public expenditures that this model [our CBA model] attributes to all children not receiving Lovaas treatment". Our supplementary cost assumptions for the "without" treatment

[1] John W. Jacobson et al, *Financial Cost and Benefits of Intensive Early Intervention for Young Children with Autism – Pennsylvania Model Achieving Cost Savings.*

scenario are provided in Table 2A, attached. The difference between Table 2A and Table 2 of our preliminary report is that cost assumptions for Outcome 1 (Normal) have been added in Table 2A.

As no substantial expenditures in education and adult care are expected for children "without" treatment who achieve normal functioning, we assume costs incurred by children achieving normal functioning are the same "with" or "without" Lovaas treatment beyond age 6. From age 3 to age 6, costs incurred by children achieving normal functioning "without" treatment are assumed to be the same as costs incurred by children "without" treatment who belong to the semi-dependent category.

Table 3A, attached, provides a revised comparison of annual costs for "with" and "without" Lovaas treatment by age range and outcome. Although weights for each outcome in Table 3A are the same as in the Base Case of our preliminary report, expected annual cost savings can be estimated by assuming any specific weight for each outcome (as illustrated in Tables 3B and 3C, which will be discussed later in Section 2.2).

➢ Effectiveness Assumptions

In Section 3.2 of our preliminary report, we carried out a series of sensitivity analyses, the first of which was "Cost Savings of Lovaas Treatment by Outcome Distributions" (Table 7 of preliminary report). Table 7 calculated the cost savings (benefits) of Lovaas treatment by changes in the outcome distribution for the "with" Lovaas treatment scenario, the "without" Lovaas treatment scenarios and both scenarios simultaneously.

Variations in the "with" treatment outcomes were assumed as follows in our previous report:

(i) 10% of children "with" treatment will remain very dependent;

(ii) 20% - 60% achieve normal functioning;

(iii) (i) and (ii) imply that 30% - 70% of children are assumed to be semi-dependent.

Variations in the "without" treatment outcomes were assumed as follows in Table 7 of the preliminary report:

(a) 0% of children "without" treatment will achieve normal functioning;

(b) 40% - 80% achieve semi-dependent;

(c) (a) and (b) imply that 20% - 60% of children are assumed to remain very dependent.

In the following, we vary these assumptions step by step to explore the impact on our CBA results. Our sensitivity testing in the downward (less favourable) direction extends to the point of zero difference in effectiveness between the "with" and "without" scenarios.

2.1 Increasing the proportion of "Very Dependent" under "With" Lovaas

Green et al suggest that our assumption that only 10% of children "with" treatment remain very dependent (assumption (i) above) is overly optimistic. In Tables 7A and 7B, attached, we re-run the model allowing a higher proportion of children "with" treatment in the very dependent category.

Table 7A: Cost Savings of Lovaas Treatment By Outcome Distribution where **20%** of children "with" treatment are assumed to remain very dependent; detailed assumptions are listed in the table below:

Outcome	"With" Lovaas	"Without" Lovaas
Normal	20% - 60%	0%
Semi-dependent	20% - 60%	40% - 80%
Very Dependent	20%	20% - 60%

Table 7 of our preliminary CBA report indicated a net benefit of Lovaas treatment of about $1.01 million (excluding wages) per child, with an associated internal-rate-of-return of 42% for the Base Case. The Target Sensitivity Case[2] (shaded cell) in Table 7A shows that increasing the percentage of children "with" Lovaas who remain very dependent to 20% yields a net benefit from Lovaas treatment of $0.83 million (excluding wages), with an associated internal-rate-of-return of 35%. Sensitivity test results for various cases other than the Target Sensitivity Case are provided in cells surrounding the shaded cell in Table 7A.

[2] Target Sensitivity Case is defined as the case when the median "with" Lovaas outcome distribution and the median "without" Lovaas outcome distribution occur simultaneously. For example in Table 7A, when the "with" Lovaas outcome distribution varies from 20/60/20 (normal/semi-dependent/very dependent, with the very dependent set at a constant 20% in Table 7A) to 60/20/20, the median "with" Lovaas distribution will be 40/40/20. Similarly, when the "without" Lovaas outcome distribution varies between 0/40/60 to 0/80/20, the median "without" Lovaas distribution will be 0/60/40. Similar concept is followed in Tables 7 (B–E). Results for Target Sensitivity Case are shaded and the corresponding internal-rate-of-return (excluding wages) is calculated in each table.

Table 7B: Cost Savings of Lovaas Treatment By Outcome Distribution where **30%** of children "with" treatment are assumed to remain very dependent; detailed assumptions are listed in the table below:

Outcome	"With" Lovaas	"Without" Lovaas
Normal	20% - 60%	0%
Semi-dependent	10% - 50%	40% - 70%
Very Dependent	**30%**	30% - 60%

The Target Sensitivity Case in Table 7B shows that increasing the percentage of children "with" Lovaas who remain very dependent to 30% yields a net benefit from Lovaas treatment of $0.75 million (excluding wages), with an associated internal-rate-of-return of 32%. Sensitivity test results for various cases other than the Target Sensitivity Case are provided in cells surrounding the shaded cell in Table 7B.

2.2 Increasing the proportion of "Normal" under "Without" Lovaas

Green et al suggest that the assumption that 0% of children "without" treatment appear in the normal functioning category (our assumption (a) above) seems to be biased in favour of Lovaas treatment. They indicate that about 10-20% of a population of children with autism achieve employment independent of specific treatment program. In Tables 7C and 7D, attached, we re-run the model allowing a higher proportion of children "without" treatment in the normal functioning category.

Table 7C: Cost Savings of Lovaas Treatment By Outcome Distribution where **10%** of children "without" treatment are assumed to achieve normal functioning; detailed assumptions are listed in the table below:

Outcome	"With" Lovaas	"Without" Lovaas
Normal	20% - 60%	**10%**
Semi-dependent	30% - 70%	40% - 80%
Very Dependent	10%	10% - 50%

The Target Sensitivity Case in Table 7C shows that increasing the percentage of children "without" Lovaas who obtain normal functioning to 10% yields a net benefit from Lovaas treatment of $0.65 million (excluding wages), with an associated internal-rate-of-return of 28%. Sensitivity test results for various cases other than the Target Sensitivity Case are provided in cells surrounding the shaded cell in Table 7C.

Table 7D: Cost Savings of Lovaas Treatment By Outcome Distribution where **20%** of children "without" treatment are assumed to achieve normal functioning; detailed assumptions are listed in the table below:

Outcome	"With" Lovaas	"Without" Lovaas
Normal	20% - 60%	**20%**
Semi-dependent	30% - 70%	40% - 70%
Very Dependent	10%	10% - 40%

The Target Sensitivity Case in Table 7D shows that increasing the percentage of children "without" Lovaas who obtain normal functioning to 20% yields a net benefit from Lovaas treatment of $0.38 million (excluding wages), with an associated internal-rate-of-return of 22%. For cases surrounding the Target Sensitivity Case in Table 7D, net benefits from Lovaas treatment remain positive except in one case, when the "with" and "without" Lovaas outcome distributions are exactly the same (i.e., there is zero difference in effectiveness between the "with" and "without" treatment scenarios).

This can be explained by the attached Table 3B, where this specific case is explored in terms of annual cost comparison. The net loss is simply the present value of the incremental cost of "with" Lovaas vs "without" Lovaas over the three-year intervention period.

2.3 Increasing the proportion of "Very Dependent" under "With" Lovaas and the proportion of "Normal" under "Without" Lovaas

Table 7E: Cost Savings of Lovaas Treatment By Outcome Distribution where **30%** of children "with" treatment are assumed to remain very dependent and **20%** of children "without" treatment are assumed to achieve normal functioning; detailed assumptions are listed in the table below:

Outcome	"With" Lovaas	"Without" Lovaas
Normal	20% - 60%	**20%**
Semi-dependent	10% - 50%	40% - 50%
Very Dependent	**30%**	30% - 40%

The Target Sensitivity Case in Table 7E shows that increasing the percentage of children "without" Lovaas who obtain normal functioning to 20% and simultaneously increasing the percentage of children "with" Lovaas but remain very dependent to 30% yields a net benefit from Lovaas treatment of $0.30 million (excluding wages), with an associated internal-rate-of-return of 16%. For cases surrounding the Target Sensitivity Case in Table 7E, net benefits from Lovaas treatment remain positive except in one case, when the

"with" and "without" Lovaas outcome distributions are exactly the same (i.e., there is zero difference in effectiveness between the "with" and "without" treatment scenarios).

This can be explained by the attached Table 3C, where this specific case is explored in terms of annual cost comparison. The net loss is simply the present value of the incremental cost of "with" Lovaas vs "without" Lovaas over the three-year intervention period.

2.4 CBA Results of Additional (Downward) Sensitivity Tests

To facilitate the comparison of the Base Case result of our preliminary report with the Target Sensitivity Case results under the alternative scenarios examined in Sections 2.1 – 2.3, Table I below provides a summary of the related results contained in the associated tables.

Table I Net Benefits From Lovaas - Base Case vs Target Sensitivity Cases

Table	Net Benefits (Millions)*	IRR
7	$1.01	42.28%
7A	$0.83	34.97%
7B	$0.75	32.38%
7C	$0.65	27.81%
7D	$0.38	22.19%
7E	$0.30	16.19%

*: *Excluding Wages*

From Tables 7 (A-E) and Table I, we observe the following:

(a) Extending the sensitivity analysis further in the less favourable direction results in reduced net benefits from Lovaas treatment, however, in all of the Target Sensitivity Cases of Tables 7(A-E), net benefits remain substantially positive;

(b) When the surrounding cases in all five tables (Tables 7 (A-E)) are considered, only two yield negative benefits, which occur under the extreme assumption that there is zero difference in effectiveness between the "with" and "without" treatment scenarios;

(c) Of all these alternative scenarios, the internal-rate-of-return for the Target Sensitivity Case remains significantly higher than any of the hurdle rates[3] used in our preliminary CBA study.

Hence, skewing the sensitivity analysis even further towards the "downside" scenarios consolidates the "robustness" of our preliminary CBA results. This conclusion holds before considering the positive effect of increased quality-of-life discussed in Section 6 of our earlier reply to Green et al.

This concludes our supplementary reply.

Yours truly,

Douglas G. Hildebrand
Director

Att.

[3] Discussed in detail in Section 2.8.2 of our preliminary report.

Data Appendix: Description of Cost Derivation and Data Sources for Costs Used in CBA Study of Lovaas Treatment

Cost Item	Cost Used in CBA (Bolded Figures)	Detailed Cost Derivation	Data Source
Child Care			
Early Intensive Intervention	$65,000	Sum of the four major categories, rounded to the nearest $1,000 (For all 3 "with" treatment" Outcomes).	Therapists and consultant's service charges are based on information from B.C. families currently running programs in B.C. (as provided through counsel); Traveling expenses include airline ticket, hotel accommodations, car rentals and food/meals; Teaching materials include arrangement cost for professional workshops and seminars, etc.
(Lovaas Treatment Cost)	$28,080	- Junior Therapists @ $15/hour for 36 hours/week, 52 weeks/year	
	$7,800	- Senior Therapists @ $25/hour for 6 hours/week, 52 weeks/year	
	$16,500	- Consultant @1,500/day for minimum of 9 days/year, plus a minimum of $3,000 travel expenses/year	
	$13,095	- Teaching Materials @25% of the total of Therapists and Consultant service charges	
Respite Services	$3,700	Mid-point of cost range $3,200 and $4,100, rounded to the nearest $100.	Cost ranges are based on information from B.C. families currently running programs in B.C. (as provided through counsel)
Behaviour Support	$8,300	Directly based on cost amount provided, rounded to the nearest $100.	Based on information from B.C. families currently running programs in B.C. (as provided through counsel)
Supported Childcare	$9,600	Directly based on cost amount provided, rounded to the nearest $100.	Based on information from B.C. families currently running programs in B.C. (as provided through counsel)
Placement	$32,400	Based on the lower range of $2,700 - $7,500 monthly costs, for 12 months	Cost ranges are monthly residential costs per child based on Gateway Task Force Report, October 1997
Education			
Normal	$4,000	Based on cost amount provided. (For Outcome 1 only)	Ministry of Attorney General, Legal Service Branch, October 15, 1999 (Page 2)
Low incidence/high cost	$27,650	@ 70% of the cost quoted for 'Intensive Special' (For Outcome 2 only)	
Intensive Special	$39,500	$16,500 + A top-up amount, Top-up Amount = ($18,000 +$28,000)/2	$16,500 is the grant per child with autism or ASD provided by government, based on inofrmation provided by Ministry of Attorney General, Legal Service Branch, October 15, 1999 (Page 3); top-up amount is based on information provided by counsel
Adult Care			
Day Program	$26,400	@ $2,200/month for12 months	Based on information contained in the survey conducted by the Ministry of Children and Families Tab 4, Graph 3: Residential Services 1998/99, Types of Services and Associated Cost per day; Gateway Contracts - Residential
Residential (Family Home)	$71,820	@ 70% of the cost quoted for 'Residential (Group Home)' (For Outcome 2 only)	
Residential (Group Home)	$102,600	Sum of two kinds of residential placement for adults, namely, family homes ($22,630) and group home ($80,003), rounded to the nearest $100.	Both figures are based on information contained in the survey conducted by the Ministry of Children and Families Tab 4, Graph 4: Residential Services, Staffed Group Homes vs. Family Care

Table 2A Estimated Costs For The "Without" Lovaas Treatment Scenario

Cost Item	Outcome 1: Normal			Outcome 2: Semi-dependent			Outcome 3: Very Dependent		
	Annual Amount	Starting Age	Ending Age	Annual Amount	Starting Age	Ending Age	Annual Amount	Starting Age	Ending Age
Child Care									
Respite Services	$2,590	3	6	$2,590	3	19	$3,700	3	19
Behaviour Support	$5,810	3	6	$5,810	3	19	$8,300	3	19
Supported Childcare	$6,720	3	6	$6,720	3	12	$9,600	3	18
Placement	$22,680	3	6	$22,680	3	19	$32,400	3	19
Education									
Normal	$4,000	6	19	$0	N/A	N/A	$0	N/A	N/A
Low incidence/high cost	$0	N/A	N/A	$27,650	6	19	$0	N/A	N/A
Intensive Special	$0	N/A	N/A	$0	N/A	N/A	$39,500	6	19
Adult Care									
Day Program	$0	N/A	N/A	$18,480	19	LFT	$26,400	19	LFT
Residential (Family Home)	$0	N/A	N/A	$71,820	19	LFT	$0	N/A	N/A
Residential (Group Home)				$0	N/A	N/A	$102,600	19	LFT

LFT: lifetime

Table 3A Expected Annual Costs and Cost Savings - Base Case

	Costs for With Lovaas Treatment				Costs for Without Lovaas Treatment				Annual Cost Savings
	Annual Amount				Annual Amount				
Age Range	Normal	Semi-Dependent	Very Dependent	Expected Annual Cost	Normal	Semi-Dependent	Very Dependent	Expected Annual Cost	
Weight	40%	50%	10%	100%	0%	50%	50%	100%	
3 - 6	65,000	65,000	65,000	**65,000**	37,800	37,800	54,000	**45,900**	**-19,100**
6 - 12	4,000	65,450	93,500	**43,675**	4,000	65,450	93,500	**79,475**	**35,800**
12 - 18	4,000	58,730	93,500	**40,315**	4,000	58,730	93,500	**76,115**	**35,800**
18 - 19	4,000	58,730	83,900	**39,355**	4,000	58,730	83,900	**71,315**	**31,960**
19 +	0	90,300	129,000	**58,050**	0	90,300	129,000	**109,650**	**51,600**

Table 3B Expected Annual Costs and Cost Savings

- Outcome Distribution as 20/70/10 for both "with" and "without" Lovaas Treatment

	Costs for With Lovaas Treatment				Costs for Without Lovaas Treatment				Annual Cost Savings	PV Cost Savings
	Annual Amount				Annual Amount					
Age Range	Normal	Semi-Dependent	Very Dependent	Expected Annual Cost	Normal	Semi-Dependent	Very Dependent	Expected Annual Cost		
Weight	20%	70%	10%	100%	20%	70%	10%	100%		
3 - 6	65,000	65,000	65,000	**65,000**	37,800	37,800	54,000	**39,420**	-25,580	-72,879
6 - 12	4,000	65,450	93,500	**55,965**	4,000	65,450	93,500	**55,965**	0	0
12 - 18	4,000	58,730	93,500	**51,261**	4,000	58,730	93,500	**51,261**	0	0
18 - 19	4,000	58,730	83,900	**50,301**	4,000	58,730	83,900	**50,301**	0	0
19 +	0	90,300	129,000	**76,110**	0	90,300	129,000	**76,110**	0	0

Table 3C Expected Annual Costs and Cost Savings

- Outcome Distribution as 20/50/30 for both "with" and "without" Lovaas Treatment

	Costs for With Lovaas Treatment				Costs for Without Lovaas Treatment				Annual Cost Savings	PV Cost Savings
	Annual Amount				Annual Amount					
Age Range	Normal	Semi-Dependent	Very Dependent	Expected Annual Cost	Normal	Semi-Dependent	Very Dependent	Expected Annual Cost		
Weight	20%	50%	30%	100%	20%	50%	30%	100%		
3 - 6	65,000	65,000	65,000	**65,000**	37,800	37,800	54,000	**42,660**	**-22,340**	**-63,648**
6 - 12	4,000	65,450	93,500	**61,575**	4,000	65,450	93,500	**61,575**	**0**	**0**
12 - 18	4,000	58,730	93,500	**58,215**	4,000	58,730	93,500	**58,215**	**0**	**0**
18 - 19	4,000	58,730	83,900	**55,335**	4,000	58,730	83,900	**55,335**	**0**	**0**
19 +	0	90,300	129,000	**83,850**	0	90,300	129,000	**83,850**	**0**	**0**

Table 7A Cost Savings of Lovaas Treatment By Outcome Distributions

Target Sensitivity Case (Shaded)			
"With" Lovaas		"Without" Lovaas	
40%	Normal	0%	Normal
40%	Semi-dependent	60%	Semi-dependent
20%	Very Dependent	40%	Very Dependent

Excluding Wages

"With" Lovaas Outcome Distribution	"Without" Lovaas Outcome Distribution				
	0/40/60	0/50/50	0/60/40	0/70/30	0/80/20
20/60/20	646,773	558,862	470,951	383,040	295,129
30/50/20	828,470	740,559	652,648	564,737	476,826
40/40/20	1,010,166	922,255	834,344	746,434	658,523
50/30/20	1,191,863	1,103,952	1,016,041	928,130	840,219
60/20/20	1,373,559	1,285,649	1,197,738	1,109,827	1,021,916

Including Wages

"With" Lovaas Outcome Distribution	"Without" Lovaas Outcome Distribution				
	0/40/60	0/50/50	0/60/40	0/70/30	0/80/20
20/60/20	765,892	654,530	543,167	431,805	320,442
30/50/20	960,245	848,883	737,520	626,158	514,796
40/40/20	1,154,598	1,043,236	931,873	820,511	709,149
50/30/20	1,348,951	1,237,589	1,126,226	1,014,864	903,502
60/20/20	1,543,304	1,431,942	1,320,580	1,209,217	1,097,855

Note: IRR for the Target Sensitivity Case = 34.97%

Table 7B Cost Savings of Lovaas Treatment By Outcome Distributions

Target Sensitivity Case (Shaded)			
"With" Lovaas		"Without" Lovaas	
40%	Normal	0%	Normal
30%	Semi-dependent	60%	Semi-dependent
30%	Very Dependent	40%	Very Dependent

Excluding Wages				
"With" Lovaas Outcome Distribution	"Without" Lovaas Outcome Distribution			
	0/40/60	0/50/50	0/60/40	0/70/30
20/50/30	563,478	475,567	387,656	299,745
30/40/30	745,174	657,263	569,352	481,442
40/30/30	926,871	838,960	751,049	663,138
50/20/30	1,108,567	1,020,657	932,746	844,835
60/10/30	1,290,264	1,202,353	1,114,442	1,026,531

Including Wages				
"With" Lovaas Outcome Distribution	"Without" Lovaas Outcome Distribution			
	0/40/60	0/50/50	0/60/40	0/70/30
20/50/30	659,145	547,783	436,420	325,058
30/40/30	853,498	742,136	630,773	519,411
40/30/30	1,047,851	936,489	825,127	713,764
50/20/30	1,242,204	1,130,842	1,019,480	908,117
60/10/30	1,436,557	1,325,195	1,213,833	1,102,470

Note: IRR for the Target Sensitivity Case = 32.38%

Table 7C Cost Savings of Lovaas Treatment By Outcome Distributions

Target Sensitivity Case (Shaded)			
"With" Lovaas		"Without" Lovaas	
40%	Normal	10%	Normal
50%	Semi-dependent	60%	Semi-dependent
10%	Very Dependent	30%	Very Dependent

Excluding Wages

"With" Lovaas Outcome Distribution	"Without" Lovaas Outcome Distribution				
	10/40/50	10/50/40	10/60/30	10/70/20	10/80/10
20/70/10	460,461	372,550	284,639	196,728	108,817
30/60/10	642,158	554,247	466,336	378,425	290,514
40/50/10	823,854	735,943	648,032	560,121	472,211
50/40/10	1,005,551	917,640	829,729	741,818	653,907
60/30/10	1,187,247	1,099,336	1,011,426	923,515	835,604

Including Wages

"With" Lovaas Outcome Distribution	"Without" Lovaas Outcome Distribution				
	10/40/50	10/50/40	10/60/30	10/70/20	10/80/10
20/70/10	566,923	455,561	344,199	232,836	121,474
30/60/10	761,277	649,914	538,552	427,189	315,827
40/50/10	955,630	844,267	732,905	621,542	510,180
50/40/10	1,149,983	1,038,620	927,258	815,896	704,533
60/30/10	1,344,336	1,232,973	1,121,611	1,010,249	898,886

Note: IRR for the Target Sensitivity Case = 27.81%

Table 7D Cost Savings of Lovaas Treatment By Outcome Distributions

Target Sensitivity Case (Shaded)			
"With" Lovaas		"Without" Lovaas	
40%	Normal	20%	Normal
50%	Semi-dependent	50%	Semi-dependent
10%	Very Dependent	30%	Very Dependent

Excluding Wages

"With" Lovaas Outcome Distribution	"Without" Lovaas Outcome Distribution			
	20/40/40	20/50/30	20/60/20	20/70/10
20/70/10	190,854	102,943	15,032	-72,879
30/60/10	372,550	284,639	196,728	108,817
40/50/10	554,247	466,336	378,425	290,514
50/40/10	735,943	648,032	560,121	472,211
60/30/10	917,640	829,729	741,818	653,907

Including Wages

"With" Lovaas Outcome Distribution	"Without" Lovaas Outcome Distribution			
	20/40/40	20/50/30	20/60/20	20/70/10
20/70/10	261,208	149,846	38,483	-72,879
30/60/10	455,561	344,199	232,836	121,474
40/50/10	649,914	538,552	427,189	315,827
50/40/10	844,267	732,905	621,542	510,180
60/30/10	1,038,620	927,258	815,896	704,533

Note: IRR for the Target Sensitivity Case = 22.19%

Table 7E Cost Savings of Lovaas Treatment By Outcome Distributions

Target Sensitivity Case (Shaded)			
"With" Lovaas		"Without" Lovaas	
40%	Normal	20%	Normal
30%	Semi-dependent	50%	Semi-dependent
30%	Very Dependent	30%	Very Dependent

Excluding Wages		
"With" Lovaas	"Without" Lovaas Outcome Distribution	
Outcome Distribution	20/40/40	20/50/30
20/50/30	24,263	-63,648
30/40/30	205,959	118,048
40/30/30	387,656	299,745
50/20/30	569,352	481,442
60/10/30	751,049	663,138

Including Wages		
"With" Lovaas	"Without" Lovaas Outcome Distribution	
Outcome Distribution	20/40/40	20/50/30
20/50/30	47,714	-63,648
30/40/30	242,067	130,705
40/30/30	436,420	325,058
50/20/30	630,773	519,411
60/10/30	825,127	713,764

Note: IRR for the Target Sensitivity Case = 16.19%

3656
Ex. A to Affidavit of Douglas G. Hildebrand dated March 23, 2000

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DOUGLAS G. HILDEBRAND, B.A. (Economics), M.B.A.

A. Overview Résumé – Litigation Economics

Mr. Hildebrand holds a B.A. Economics (with Distinction) from the University of Saskatchewan (1969) and a Master of Business Administration (M.B.A.) from the University of British Columbia (1971).

During the 1968 to 1972 period, Mr. Hildebrand held economic research positions with the federal government and the University of British Columbia. Since 1972, Mr. Hildebrand has been practising as a Senior Economic Consultant based in Vancouver, and has been practising at the Partner level since 1975. He has been Director of Columbia Pacific Group, a management and economic consulting firm, since 1980.

A primary area of practice includes economic and financial assessments for litigation, regulatory and project approval purposes (courts, administrative and regulatory tribunals, arbitration hearings, government review agencies). Mr. Hildebrand's consulting activities include assessment of damages in personal injury and fatality cases; and economic assessments of major projects and policies (e.g., cost-benefit analysis), including major project facility applications before Canadian regulatory authorities and review agencies.

Mr. Hildebrand has undertaken over 1,000 assignments since the mid-1980s involving economic and financial assessments of damage claims for personal injury and fatality cases. Assessments have included earnings projections for educational referent groups and a broad range of occupations inclusive of statistical labour market contingencies; income allocations in fatality cases for the purpose of determining loss of financial support; assessment of household services; income and cost of care multipliers; present value of care costs; management fee and tax gross-up simulations; critique of expert reports; and expert testimony in B.C. Supreme Court on numerous occasions.

Mr. Hildebrand is a member of professional economist associations including member and Past President of the Association of Professional Economists of British Columbia.

000104

Mr. Hildebrand is also trained as a commercial arbitrator/mediator, practises as a mediator of personal injury cases and is a member of the BC Arbitration and Mediation Institute and the Commercial Mediation Association.

This is Exhibit A *"referred to in the affidavit of* Douglas G. Hildebrand
sworn before me, at Vancouver BC
this 23rd *day of* March 2000

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DOUGLAS G. HILDEBRAND – Résumé (Cont'd.)

B. Cost-Benefit Analysis Experience

Mr. Hildebrand is experienced in undertaking cost-benefit analysis (CBA) and/or discounted-cash-flow (DCF) analysis of proposed capital projects and policies covering most key sectors of the economy.

CBA assessments have been undertaken by Mr. Hildebrand in accordance with provincial (British Columbia) and/or federal government guidelines on cost-benefit analysis. Net benefits have been determined and tested under a range of assumptions including costs, discount rates, markets (volume, prices) and environmental externalities (e.g., air pollution). Adjustments have been applied to labour and non-market resources, where appropriate, ("shadow prices") in the valuation of costs and benefits. Examples of CBA and related economic/financial assessments undertaken by Mr. Hildebrand include the following:

Representative Projects – Economic/Financial Analysis

- Cost-Benefit Analysis of the Vancouver Island Natural Gas Pipeline	Inland Natural Gas Co. Ltd.
- Cost-Benefit Analysis of Oil Transportation Projects	TransMountain Oil Pipeline Co.
- Cost-Benefit Analysis of Aluminum Smelter and Hydro Power Complex	Aluminum Company of Canada, Ltd
- Cost-Benefit Analysis of Railway Bridge Options (with Crippen)	Public Works Canada
- Cost-Benefit Analysis of Relocating Rail Lines in Vancouver's Urban Core	City of Vancouver
- Cost-Benefit Analysis of Natural Gas Vehicle Use	BC Hydro
- Cost-Benefit Analysis of Natural Gas Exports	Pan Alberta Gas

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DOUGLAS G. HILDEBRAND – Résumé (Cont'd.)

Representative Projects – Economic/Financial Analysis

- Cost-Benefit Analysis of Natural Gas Processing Facilities in Northeast B.C.	Westcoast Energy Inc.
- Cost-Benefit analysis of a Hydroelectric Project	B.C. Hydro
- Cost-Benefit Analysis of Airport Road/Ferry Improvements	City of Prince Rupert
- Financial (DCF) Valuation of the Line Creek Coal Mine	Shell Canada Resources
- Financial (DCF) Valuation of the Quintette Coal Mine	Denison Mines Ltd.
- Financial (DCF) Valuation of the Balmer and Greenhills Coal Mines	Westar Mining Ltd.
- Financial (DCF) Valuation of Ridley Terminals	Ridley Terminals Inc.
- Cost-Benefit Valuation of the UBC Co-generation Project	University of British Columbia
- Cost-Benefit Valuation of Electricity Exports from B.C.	B.C. Utilities Commission
- Cost-Benefit Valuation of Private Hydro Projects in B.C.	Iskut Pulpower; Canadian/French Consortium
- Cost-Benefit Valuation of Gold-Copper Mine in B.C.	Private Mining Company
- Financial (DCF) Valuation of Independent Power Producer	Private Arbitration
- Cost-Benefit Valuation of Non-Power Uses of Hydroelectric Reservoir	BC Hydro
- Financial Impact of Container Port Expansion at Roberts Bank	Vancouver Port Corp; Corporation of Delta
- Cost-Benefit Analysis of Strategies to Enhance Pacific Rim Traffic Links through Vancouver International Airport	Transport Canada

DOUGLAS G. HILDEBRAND – Résumé (Cont'd.)

C. *Expert Witness Appearances – Economic/Financial Analysis*

- B.C. Supreme Court (numerous appearances)
- Federal Court of Canada
- Superior Court, State of Washington
- Assessment Appeal Board of B.C.
- Expropriation Compensation Board of B.C.
- B.C. Utilities Commission
- Manitoba Public Utilities Board
- National Energy Board
- National Farm Products Marketing Council
- Private Commercial Arbitrations
- Environmental Assessment Hearing

Behavioral Interventions
Behav. Intervent., 13, 201–226 (1998)

COST–BENEFIT ESTIMATES FOR EARLY INTENSIVE BEHAVIORAL INTERVENTION FOR YOUNG CHILDREN WITH AUTISM—GENERAL MODEL AND SINGLE STATE CASE

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Clinical research and public policy reviews that have emerged in the past several years now make it possible to estimate the cost–benefits of early intervention for infants, toddlers, and preschoolers with autism or pervasive development disorder—not otherwise specified (PDD—NOS). Research indicates that with early, intensive intervention based on the principles of applied behavior analysis, substantial numbers of children with autism or PDD—NOS can attain intellectual, academic, communication, social, and daily living skills within the normal range. Representative costs from Pennsylvania, including costs for educational and adult developmental disability services, are applied in a cost–benefit model, assuming average participation in early intensive behavioral intervention (EIBI) for three years between the age of 2 years and school entry. The model applied assumes a range of EIBI effects, with some children ultimately participating in regular education without supports, some in special education, and some in intensive special education. At varying rates of effectiveness and in constant dollars, this model estimates that cost savings range from $187,000 to $203,000 per child for ages 3–22 years, and from $656,000 to $1,082,000 per child for ages 3–55 years. Differences in initial costs of $33,000 and $50,000 per year for EIBI have a modest impact on cost–benefit balance, but are greatly outweighed by estimated savings. The analysis indicates that significant cost-aversion or cost-avoidance may be possible with EIBI. © 1998 John Wiley & Sons, Ltd.

INTRODUCTION

As expenditures for social welfare, public health, and specialized human services have increased dramatically over the past two decades, there has been an increasing impetus for understanding the costs and consequences (i.e., benefits) of

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CCC 1072–0847/98/040201–26$17.50

the investment of public resources in specific programs and services for children with, or at risk for, disabilities. Welfare reform, Medicaid reform (through such initiatives as managed care and home and community-based services waivers), and scrutiny of the rising costs of early intervention, special education, and adult disability services are all manifestations of the need to contain costs and direct resources in the most efficient and effective ways possible. In the area of early intervention and preschool services as a whole, there has been mounting concern regarding cost–benefit (Guralnick, 1998). This concern has most likely arisen because of the perceived wide variations in costs for seemingly similar services available through public providers and private contractors (see, e.g., Schopler, 1998). There are additional likely concerns that possible economies may be lost when substitute financing mechanisms (for example, Medicaid fee-for-service) are used in lieu of system-wide cost-related rates within educational or other specialized public services (see, e.g., Division of Health, 1997; Eisenhofer, Grant, DiPersio, & German, 1998).

The costs and benefits of services for young children with autism or pervasive developmental disorder—not otherwise specified (PDD—NOS, hereafter abbreviated PDD) have come under particularly intense scrutiny of late (see, e.g., Gresham & MacMillan, 1997; Schopler, 1998). Following the publication of research reports indicating that substantial proportions of children with autism or PDD who received early intensive behavioral intervention (EIBI) achieved normal or near-normal functioning (Lovaas, 1987; McEachin, Smith, & Lovaas, 1993), demand for this intervention has increased. The research findings have been controversial, however, for several reasons: they are relatively recent; the studies are subject to methodological criticisms; they have emerged from a small number of research and service projects; and the intervention is intensive, specialized, highly directive, and expensive. Moreover, these findings have emerged at a time when leaders of some philosophical movements in special education are advocating apparently incompatible practices of unproven efficacy, especially under such rubrics as 'total inclusion' and 'developmental appropriateness' (Kauffman & Hallahan, 1995).

Direct and indirect criticisms of EIBI by some of these advocates have focused on alleged negative side effects (see, e.g., Autism National Committee, 1995a; 1995b; Greenspan & Weider, 1997; Wetherby, Schuler, & Prizant, 1997). Despite their frequent citation, these criticisms are not grounded in sound research or established facts; they involve misinterpretations of behavioral intervention, incomplete or inaccurate understanding of behavioral principles and procedures, or are otherwise suppositional and groundless (Cameron & Pierce, 1994; Eisenberger & Cameron, 1996; Lovaas, 1995; 1996; Luce & Dyer, 1996). Additionally, treatments for autism or PDD most often recommended in lieu of

EIBI typically lack demonstrated efficacy for achieving large and lasting gains (Eaves & Ho, 1996; Freeman, 1997; Green, in press; Smith, 1993; 1996). Thus, for many clinicians and researchers, the question is not whether children with autism or PDD can achieve substantially improved functioning, but what practices lead to the best outcomes for these children and whether the methodology underpinning the research findings on EIBI is sound (see, e.g., Foxx, 1993; Guralnick, 1998; Gresham & MacMillan, 1997; Schopler, Short, & Mesibov, 1989).

This report presents a cost–benefit analysis of EIBI for children with autism or PDD. We estimate costs and benefits of services for children with autism or PDD who receive EIBI relative to those of children without disabilities in general, and children with autism or PDD who do not receive effective intervention or who otherwise continue to need intensive supports. The analysis provides a projection of cost-aversion, that is, the financial costs to society avoided through provision of EIBI services.

Prior Cost–Benefit Analysis

Although critics of EIBI stress philosophical concerns, from a public policy standpoint, the scientifically validated achievement of normal functioning by many children with autism or PDD has profound implications for analysis of the relative costs and benefits of EIBI for these children (see Barnett & Escobar, 1990, for a prospective cost–benefit analysis model). Until recently, benefits could be estimated exclusively in terms of savings that might be associated with decreased, but still persisting, dependency on special service requirements (e.g., supervision) in later childhood and into adulthood. Considering the high cost of specialized educational services for children with autism or PDD compared to regular education or to other categories of special education, potential benefits were confined to relative savings at different levels of care during adulthood. Possible savings reflected comparison of total educational, supportive, and adult services costs with and without EIBI. Because no basis was generally evident for estimating these cost differentials (such as those used by Barnett & Escobar, 1990), the cost–benefit of EIBI for these children has remained unspecified.

EIBI for Autism or PDD

First identified in the 1940s (Kanner, 1943), autism is a disorder of brain development arising before age three, and often identified by that age or shortly thereafter (Bailey, Phillips Rutter, 1996; Rapin, 1997). It is diagnosed

behaviorally, by observing a child for qualitative impairments in three main areas: disordered social interactions, delayed or disordered communication, and restriction in range of interests and activities. It is also characterized by stereotyped behavior, such as ritualistic or repetitive acts (APA, 1994). Historically, it has generally been found that 50–75% of individuals with autism also have some degree of mental retardation (Freeman, 1997; Rapin, 1997), but the rate at which mental retardation is present among people with autism may be somewhat higher because of difficulties in ascertainment among people with profound mental retardation, and inconsistent access for young children with mental retardation to clinicians familiar with autism spectrum disorders.

The relationship between autism and mental retardation is not well understood. Some children with autism have intellectual abilities within the normal—and, in a small number of cases, the superior—range. However, research clearly indicates that children with both autism and mental retardation tend to enter adulthood with these conditions still present (Eaves & Ho, 1996; Jacobson & Ackerman, 1990; Janicki & Jacobson, 1983; Locke, Banken, & Mahone, 1994). They require lifelong care, services, and supervision. Spontaneous recovery and highly successful rehabilitation through special educational processes are very rare. Educational services for children with autism are among the most intensively staffed and expensive forms of special education available under provisions of the Individuals with Disabilities Education Act. The picture is similar for children diagnosed with PDD—NOS, which has many characteristics in common with autism.

During the past 15 years research has begun to demonstrate that significant proportions of children with autism or PDD who participate in early intensive intervention based on the principles of applied behavior analysis (ABA) achieve normal or near-normal functioning (Lovaas, 1987; McEachin, Smith, & Lovaas, 1993) or significant gains in measured intelligence or other aspects of development (Anderson, Avery, DiPietro, Edwards, & Christian, 1987; Birnbrauer & Leach, 1993; Fenske, Zalenski, Krantz, & McClannahan, 1985). Prior to and concurrent with these studies of EIBI, more than 500 studies were published demonstrating the efficacy of numerous ABA techniques for building a wide range of skills in people with autism of all ages (according to the selection criteria used by DeMyer, Hingtgen, & Jackson, 1981; Hingtgen & Bryson, 1972; Matson, Benavidez, Compton, Paclawskyj, & Baglio, 1996). While this collection of studies does not represent a unitary program model for children with autism, in the aggregate it is the empirical foundation on which most home- and center-based EIBI programs are built.

The most comprehensive research on EIBI was published by Lovaas and colleagues at UCLA (e.g., Lovaas, 1987; McEachin *et al.*, 1993), but other

independent investigators confirmed that it is possible for children with autism or PDD to achieve large, comprehensive, and lasting gains (e.g., Birnbrauer & Leach, 1993; Fenske *et al.*, 1985; Perry, Cohen, & DeCarlo, 1995; Sheinkopf & Siegel, 1998). It is important to note that many children in the study samples whose skills did not reach normal levels nonetheless made substantial, functional gains in several core areas, such as everyday living and communication skills. A small proportion (about 10%, across studies) appeared to continue to need intensive intervention beyond the early childhood years. Research is ongoing to better identify the specific child characteristics and instructional and programmatic practices that are related to differential outcomes in these children (Green, 1996b; Guralnick, 1998; Smith, Eikeseth, Klevstrand, & Lovaas, 1997).

With the emergence of research documenting substantial improvements for some children with autism or PDD following EIBI, and confirmatory reports that the effects can endure into later childhood (e.g., McEachin *et al.*, 1993; Perry *et al.*, 1995) and adulthood (Smith, 1998), it has become possible to estimate costs and utilization more specifically. Such estimations are aided by the compilation of costs for adult services in the developmental disabilities service sector by contemporary researchers, data that were not previously available. Thus, costs and benefits for EIBI for autism or PDD may be estimated with reasonable confidence in terms of (i) children who achieve normal functioning, participate in regular education with little or no support, and are vocationally productive as adults, (ii) children who derive sufficient benefit that they are then able to participate in less intensive special education, and evidence persisting but reduced dependency in adulthood (referred to hereinafter as partial effects), and (iii) children who achieve meaningful functional improvements but still require specialized and intensive educational and adult services (referred to as minimal effects).

In the present analyses, costs from the Commonwealth of Pennsylvania are used to develop overall cost comparisons in the calculation of cost–benefit (see appendix A). The model used by Barnett and Escobar (1990) was a prospective analysis of cost and effect associated with early intervention services for a heterogeneous group of at-risk pre-schoolers. The model used for the present analyses, in contrast, entails projection of costs based on economic extrapolations and trends in allocation of services and costs in educational and adult developmental services. Because this method entails economic forecasting rather than cost tracking, it is important to articulate the assumptions that form the basis for the present forecast. The 16 assumptions required to structure these analyses are detailed in appendix B and are indicated as analytic considerations or elements below.

METHODS

Assumptions in the Present Analysis

The assumptions underpinning the general cost model in this paper are the following:

(i) Current research does not identify characteristics of children with autism or PDD that reliably predict their response to EIBI.
(ii) The proportion of children who achieve normal functioning in all areas is probably somewhat lower than the proportion reported in the literature to date (just under 50%).
(iii) In any group of children with autism or PDD who receive competently delivered EIBI, between 20 and 50% will achieve normal functioning; about 40% will achieve meaningful but moderate gains; and about 10% will continue to require intensive special education and adult services.
(iv) For these reasons, cost–benefit should be couched in terms of marginal benefit, as well as the attainment of normal functioning.
(v) Without EIBI the majority of children with autism or PDD will manifest enduring dependency on special education and adult developmental disability services.
(vi) The mix of costs for EIBI services used here is assumed to be a representative average for both center-based and home-based services.
(vii) Children with autism or PDD who ultimately develop normal functioning are assumed to participate in regular education; those who make moderate gains are assumed to participate in special education; and children who make minimal gains are assumed to participate in intensive special education.
(viii) Because no generalizable mortality data exist for people with autism or PDD, cost–benefit analyses including the adult years are made only to age 55.
(ix) Present costs are used as indicators of future costs, with recognition that future reforms in welfare and public health services may result either in decreased per person rates or expenditures, or in substitution of services.
(x) SSI/ADC costs are used as a summary cost for all utilization of general public benefits outside of the early intervention, educational, and developmental service sectors.
(xi) The average duration of EIBI is assumed to be three years.
(xii) Children with autism or PDD who achieve normal functioning are assumed to use family support services only during participation in EIBI;

those who make moderate gains or realize minimal effects are assumed to use 18 years of these services.

(xiii) During adulthood, those who achieve moderate gains are assumed to use 18 years of Medicaid waiver (or equivalent) services and 15 years of supported work services. Similarly, for those who achieve minimal gains, 80% are assumed to use waiver services for 20 years, 20% are assumed to use intensive community services for 23 years, and 40% are assumed to use supported work services for 15 years.

(xiv) Supported employment wages are estimated at 20% of the median household annual income.

(xv) This analysis uses costs reported in several sources for the Commonwealth of Pennsylvania (from Table 1).

(xvi) The service costs and inflators used will tend to underestimate costs slightly; the earnings projected will tend to overestimate income slightly.

All savings shown are net of the expense of providing EIBI.

RESULTS

Gross Cost Differentials

Table 2 shows the estimated costs from age 3 years to 22 years for a non-disabled child, a child with an initial diagnosis of autism or PDD for whom EIBI

Table 1. Present (1996) costs for services and income estimates—Pennsylvania model

Estimate or variable	*Value*
Present age of the child with autism	3 years
Beginning calendar year	1996
Early intervention annual cost	$3,284
Family support services annual cost	$1,110
Intensive early intervention annual cost	$32,820
Regular education annual cost	$7,543
Special education annual cost	$12,935
Intensive special education annual cost	$28,806
Home and community based services (adult) annual cost	$31,818
Intensive community services (adult) annual cost	$46,838
Institutional services (or equivalent, adult) annual cost	$56,775
Supplemental security income/aid to dependent children annual cost (estimate for all generic public support costs)	$5,379
Median household annual income	$33,714
Supported wages annual value (% of median income)	$6,743

Note: This table presents a listing of the 1996 costs used in the analysis.

Table 2. Estimated costs age 3 to 22 years—Pennsylvania model

	Costs with inflation	*Costs in 1996 $*
Nondisabled Child		
Eighteen years of SSI/ADC (10%)	11,768	9,682
Thirteen years of regular education	128,731	98,061
Net	(140,459)	(107,743)
Autism—with normal range effects of early intervention		
Three years of family support services	3,433	3,330
Three years of SSI/ADC	16,380	16,137
Eighteen years of SSI/ADC (10%)	11,768	9,682
Three years of intensive early intervention	101,445	98,460
Thirteen years of regular education	128,731	98,061
Net	(261,717)	(225,670)
Autism—with partial effects of early intervention		
Eighteen years of family support services	27,873	19,980
Eighteen years of SSI/ADC	117,244	96,822
Three years of intensive early intervention	101,445	98,460
Fifteen years of special education	284,916	194,025
Net	(531,478)	(409,287)
Autism—with minimal effects of early intervention		
Eighteen years of family support services	27,873	19,980
Eighteen years of SSI/ADC	117,244	96,822
Three years of intensive early intervention	101,445	98,460
Fifteen years of intensive special education	634,486	432,090
Net	(881,048)	(647,352)

Note: Table shows (expense) only. This table presents findings regarding costs to age 22 years. These include costs for regular education, family support services, SSI/ADC, intensive early intervention, and regular, special, and intensive special education. Costs are attributed according to whether a child is nondisabled, or achieves functioning in the normal range, partial benefit, or minimal benefit from EIBI. Costs are shown separately with inflation and in 1996 dollars.

results in normal functioning, a child with an initial diagnosis of autism or PDD for whom EIBI results in partial (habilitative or remediative) effects, and a child with an initial diagnosis of autism or PDD for whom EIBI results in minimal effects. Costs for nondisabled children include those for regular education and a 10% rate of use of public services (shown as SSI/ADC). Costs for the children with autism or PDD who achieve normal range effects from EIBI include these costs plus costs for family supports, public services, and intensive early intervention. Costs for the children with autism or PDD who realize partial effects from EIBI include the costs for family supports, public services, intensive early intervention, and special education. Costs for the children with autism or PDD with minimal effects from EIBI are the same as those for children with partial effects from EIBI, except that costs for intensive special education are included.

Table 3. Costs from age 22 to age 55 years—Pennsylvania model

	Costs with inflation	*Costs in 1996 $*
Nondisabled child		
Thirty-three years of SSI/ADC and all other public benefits (10%)	(31,358)	(18,434)
Thirty-three years of wages and other income (75%)	1,768,866	801,039
Net	1,737,508	782,605
Autism—with normal range effects of early intervention		
Thirty-three years of SSI/ADC and all other public benefits (10%)	(31,358)	(18,434)
Thirty-three years of wages and other income (75%)	1,768,866	801,039
Net	1,737,508	782,605
Autism—with partial effects of early intervention		
Five years of family support services	(10,331)	(5,550)
Thirty-three years of SSI/ADC	(313,579)	(184,335)
Twenty-eight years of waiver services	(2,860,063)	(821,734)
Twenty-five years of supported work	346,982	145,121
Net	(2,836,991)	(866,498)
Autism—with minimal effects of early intervention		
Five years of family support services	(10,331)	(5,550)
Thirty-three years of SSI/ADC	(313,579)	(184,335)
Thirty years of waiver services (80%)	(2,390,031)	(610,906)
Thirty-three years of intensive community services (20%)	(948,285)	(309,131)
Twenty-five years of supported work (40%)	138,792	67,430
Net	(3,523,434)	(1,042,492)

Note: Table shows income (expense). This table presents findings regarding costs from age 22 to 55 years. These include costs for family support services, SSI/ADC, home and community based services (waiver services), or intensive community services, and income from regular or supported work. Costs are attributed according to whether a person is nondisabled, or achieves normal skills or functioning, partial benefit, or minimal benefit from EIBI. Costs (expenses) and income are shown separately with inflation and in 1996 dollars.

The sources of costs, public expenditures, are shown in Table 2 and in subsequent tables with inflation (i.e., 'Costs with inflation') and without (i.e., 'Costs in 1996 $'). Throughout the tables, net income is shown without brackets and net expenses or costs are shown with brackets. Costs with inflation are $140,459 for a nondisabled child, $261,717 with normal range effects, $531,478 with partial effects, and $881,048 with minimal effects. Corresponding present values (the amount of money invested in US treasury bonds at 6.0% annual interest at age 3 to 22 years equal to the total costs) are approximately $46,423, $86,501, $175,660, and $291,198.

Table 3 shows the estimated costs from age 22 to 55 years for nondisabled individuals, individuals with an initial diagnosis of autism or PDD for whom EIBI results in normal functioning, individuals with an initial diagnosis of autism

or PDD for whom EIBI results in partial (habilitative or remediative) effects, and individuals with an initial diagnosis of autism or PDD for whom EIBI results in minimal effects. For nondisabled children and children with autism or PDD who realize normal range effects from EIBI, as adults, both a 10% rate of use of public services (i.e., costs) and income (e.g., wages) are included in the analysis. For adults with partial effects from EIBI, costs are shown for family supports, public services, Medicaid waiver services (including residential services), and supported work. For adults with minimal effects from EIBI, costs or income are shown for family supports, public services, Medicaid waiver services, supported work, and intensive community services.

Estimated costs with inflation are $1,737,508 for a nondisabled adult or adult initially diagnosed with autism or PDD for whom EIBI results in normal functioning, $2,836,991 with partial effects, and $3,523,434 with minimal effects. Corresponding present values (money invested in US treasury bonds at 6.0% annual interest for ages 3 to 55 years) are approximately a retained value (i.e., net income equivalent to investment) of $83,950 and costs of $137,073 and $170,240. Throughout the remainder of this analysis present value (amount of money that would have to be invested by a family at the outset to pay for services over a specified time period), uninflated value (uninflated costs to place costs in the context of the expense of current goods and services), and inflated value (the number of dollars projected to be spent) are presented to allow broad interpretation of the projected costs.

The estimates of cost in Tables 2 and 3 are consolidated in Table 4 to provide a cost–benefit model for ages 3 to 55 years. With inflation, the net income for a nondisabled individual is estimated at $1,597,049 (based on the median income value shown in Table 1) and that for an individual with an initial diagnosis of autism or PDD for whom EIBI results in normal functioning, $1,475,791; corresponding present amounts for retained value invested from age 3 to 55 are approximately $77,163 and $71,305. With inflation, the net expenditures are $3,368,469 for an individual with autism or PDD for whom EIBI results in partial effects and $4,404,482 for an individual for whom EIBI results in minimal effects, with present values of about $162,753 and $212,809. Again, these represent the amount of money to be invested at the onset of services to cover the costs of services for the entire span of time.

Costs at Differing Levels of Effectiveness

In addition to comparisons of potential costs for services to age 55 with respect to differing outcomes of EIBI, it is also important to recognize the

Table 4. Financial cost–benefit of early intervention—pennsylvania model—ages 3–55 years

	With inflation	*Costs in 1996 $*
Nondisabled child		
Childhood costs	(140,459)	(107,743)
Adult cost or benefit	1,737,508	782,605
Net	1,597,049	674,862
Autism—with normal range effects of early intervention		
Childhood costs	(261,727)	(225,670)
Adult cost or benefit	1,737,508	782,605
Net	1,475,791	556,935
Autism—with partial effects of early intervention		
Childhood costs	(531,478)	(409,287)
Adult cost or benefit	(2,836,991)	(866,498)
Net	(3,368,469)	(1,275,785)
Autism—with minimal effects of early intervention		
Childhood costs	(881,048)	(647,352)
Adult cost or benefit	(3,523,434)	(1,042,492)
Net	(4,404,482)	(1,689,844)

Note: Table shows income (expense). This table combines net costs for ages 3–22 and 22–55 years from Tables 2 and 3. These costs are shown separately with inflation and in 1996 dollars.

varying levels of cost–benefit. Table 5 shows the estimated cost savings that accrue from EIBI services at rates of 20, 30, 40, and 50% achievement of normal functioning. At each level the marginal effects—i.e., the difference in costs between groups for normal range effects or partial effects from EIBI, or between groups for partial or minimal effects from EIBI—are aggregated for 100 people, and then disaggregated to a weighted average (i.e., in the columns titled 'student'). These estimates reflect service effects possibly associated with fidelity of implementation of treatment or with differing case mix. At each level, it is assumed that for 10% of children with autism or PDD, EIBI achieves minimal effects. EIBI is assumed to achieve partial effects for the remaining children.

As Table 5 shows, the average net benefit, as represented by the measure of marginal benefit (e.g., partial versus minimal effects) decreases slightly with an increase in the proportion of children for whom EIBI results in normal functioning. This finding is attributable to the greater difference in cost between nonintensive special education and intensive intervention, compared to the cost difference between nonintensive special education and regular education in this model, based on Pennsylvania cost values. For ages 3–22 years, average per student inflated marginal dollar savings range from $298,651 at 20% effectiveness to $274,709 at 50% effectiveness.

The relationship of level of treatment effectiveness to marginal benefits is markedly reversed for ages 3–55 years, and increased average marginal savings

Table 5. Financial benefits at different levels of effectiveness, age 3 to 22 years, per 100 children and per child served—Pennsylvania model

	Inflated total	*1996 $ total*	*Inflated/ student*	*1996 $/ student*
At 20% normal range				
20 norm range vs. partial effect	5,395,220	3,672,340	269,761	183,617
70 partial vs. minimal effect	24,469,900	16,664,550	349,570	238,065
10 minimal effect	0	0	0	0
Net	29,865,120	20,336,890	298,651	203,369
At 30% normal range				
30 norm range vs. partial effect	8,092,830	5,508,510	269,761	183,617
60 partial vs. minimal effect	20,974,200	14,283,900	349,570	238,065
10 minimal effect	0	0	0	0
Net	29,067,030	19,792,410	290,670	197,924
At 40% normal range				
40 norm range vs. partial effect	10,790,440	7,344,680	269,761	183,617
50 partial vs. minimal effect	17,478,500	11,903,250	349,570	238,065
10 minimal effect	0	0	0	0
Net	28,268,940	19,247,930	282,689	192,479
At 50% normal range				
50 norm range vs. partial effect	13,488,050	9,180,850	269,761	183,617
40 patial vs. minimal effect	13,982,800	9,544,200	349,570	238,065
10 minimal effect	0	0	0	0
Net	27,470,850	18,725,050	274,709	187,251

Note: This schedule presents a comparison of financial benefits at different levels of achievement of normal skills or functioning achieved by EIBI, for children ages 3–22 years, ranging from 20% of children achieving normal skills or functioning (an assumed minimal rate) to 50% of children. At each level, differing rates of achievement of normal range skills or functioning, as well as partial benefit are estimated. Costs are shown in terms of the aggregate of 100 children served, and averages per person served, with inflation and in 1996 dollars.

are associated with increased levels of effectiveness (see Table 6). The format of Table 6 is identical to that of Table 5, and differs only in that marginal costs (i.e., benefits) are shown for childhood and adulthood combined. Estimated average inflated marginal savings range from $656,385 at 20% effectiveness to $1,081,984 at 50% effectiveness. Corresponding present values for these inflated marginal savings are $31,714 and $52,279.

Summary

At a rate of normal functioning achieved by 40–50% of children with autism or PDD who receive EIBI (see, e.g., Lovaas, 1987) compared to virtually ineffective intervention, cost savings per child served are estimated to be from

Table 6. Financial benefits at different levels of effectiveness, age 3–55 years, per 100 children served and per child served—Pennsylvania model

	Inflated total	*1996 $ total*	*Inflated/ student*	*1996 $/ student*
At 20% normal range				
20 norm range vs. partial effect	96,085,200	36,654,400	4,804,260	1,832,720
70 partial vs. minimal effect	72,520,910	28,984,130	1,036,013	414,059
10 minimal effect	0	0	0	0
Net	168,606,110	65,638,530	1,686,061	656,385
At 30% normal range				
30 norm range vs. partial effect	144,127,800	54,981,600	4,804,260	1,832,720
60 partial vs minimal effect	62,160,780	24,843,540	1,036,013	414,059
10 minimal effect	0	0	0	0
Net	206,288,580	79,825,140	2,062,886	798,251
At 40% normal range				
40 norm range vs. partial effect	192,170,400	73,308,800	4,804,260	1,832,720
50 partial vs. minimal effect	51,800,650	20,702,950	1,036,013	414,059
10 minimal effect	0	0	0	0
Net	243,971,050	94,011,750	2,439,710	940,118
At 50% normal range				
50 norm range vs. partial effect	240,213,000	91,636,000	4,804,260	1,832,720
40 partial vs. minimal effect	41,440,520	16,562,360	1,036,013	414,059
10 minimal effect	0	0	0	0
Net	281,653,520	108,198,360	2,816,535	1,081,984

Note: This table presents a comparison of financial benefits at different levels or rates of achievement of normal skills or functioning achieved by EIBI, for people ages 3–55 years, ranging from 20% of children achieving normal range skills or functioning (an assumed minimal rate) to 50% of children. At each level of effectiveness, differing rates of normal range functioning, as well as partial benefit are estimated. Costs are shown in terms of the aggregate of 100 children served, and averages per person served, with inflation and in 1996 dollars.

$274,709 to $282,689 with inflation to age 22 and from $2,439,710 to $2,816,535 with inflation to age 55.

At $32,820 initial annual cost, the total cost–benefit savings of EIBI services per child with autism or PDD for ages 3–22 years ranges from $187,251 to $203,369 without inflation and from $274,709 to $298,651 with inflation. The majority of savings to schools accrue from children who achieve partial benefit rather than normal functioning, and savings decrease slightly on average with increased rates of children achieving normal functioning. At $50,000 initial annual cost, the corresponding cost–benefit savings of EIBI services per child with autism or PDD ages 3–22 years averages from $131,018 to $151,829 without inflation and from $214,801 to $246,551 with inflation.

At $32,820 initial annual cost, the total cost–benefit savings of EIBI services per child with autism or PDD for ages 3–55 years averages from $656,385

to $1,081,984 without inflation and from $1,686,061 to $2,816,535 with inflation. The majority of savings to the lifespan-oriented developmental disabilities sector accrue from children who achieve normal functioning rather than partial benefit. Savings increase substantially on average with increased rates of children achieving normal functioning. At $50,000 initial annual cost, the corresponding cost–benefit savings of EIBI services per child with autism or PDD ages 3–55 years averages from $605,385 to $1,030,984 without inflation and from $1,635,061 to $2,765,535 with inflation.

These findings are summarized in Figures 1 and 2. Figure 1 displays the net cost for services for the four childhood groups that were presented in Table 2: nondisabled, EIBI with recovery effects, EIBI with partial effects, and EIBI with minimal (i.e., 'Nil') effects. Figure 2 displays the net income or net cost for services for the same four groups, as adults, that were presented in Table 3.

DISCUSSION

Limitations of Forecasting

Although the model used here is based on a series of reasoned assumptions that are consistent with the state of the current literature on treatment and practice (see the Methods section and appendix B), several limitations should be highlighted. First, the cost differential forecasts assume that current service trends are indicative of developmental disability service trends that may extend as long as 50 years hence. Specifically, these consist of trends toward community-based adult services, and are based on differences in expenditures associated with variations in levels and intensities of services for people with disabilities. These trends appear to be reasonable in the near term but may not hold up in the long term in the context of health care reform and challenges to disability services presented by competition for resources. Further, increasing costs as the general population ages during the next 20–30 years can be expected to present unique demographic challenges to the present system of resource allocation for the community support of people with handicaps of all ages. Specific rational alternative scenarios that lend themselves to quantitative modeling, however, are not readily apparent.

Second, alternative scenarios might involve stringent cost containment practices that would limit service eligibility and tend to lower expenditures for adults with autism or PDD over the long term. In projecting costs (or expenditures) for care to age 55 we have used a compound rate of 3%. This rate, which is lower than recent past rates of growth in health care and related costs,

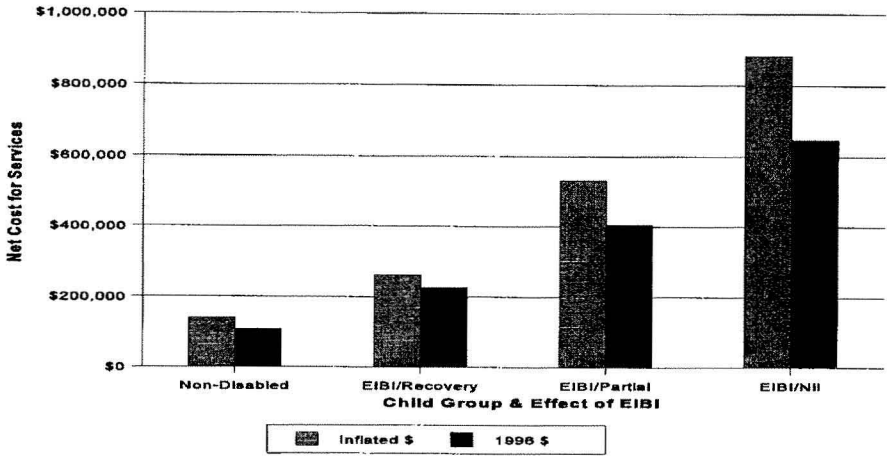

Figure 1. Net average individual cost for early intensive behavioral services ages 3–21 for nondisabled, recovered, partial benefit, and nil benefit groups. Cost is shown as with inflation and in 1996 dollars.

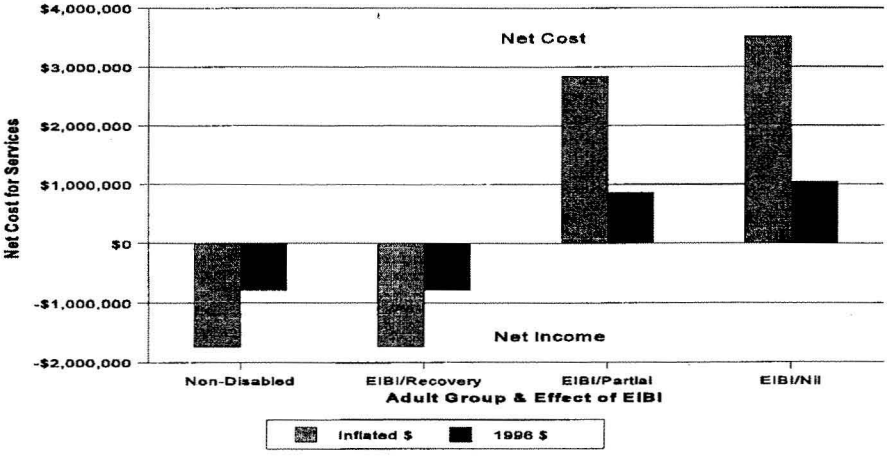

Figure 2. Net average individual cost for early intensive behavioral services ages 3–55 years for nondisabled, recovered, partial benefit, and nil benefit groups. Negative values indicative net earnings (income) and positive values indicate net costs for services. Cost is shown with inflation and in 1996 dollars.

will tend to underestimate future costs; therefore, it is possibly compatible with more stringent cost containment or imposition of limited service eligibility. Moreover, use of a rate of 10% participation in economic supports as a surrogate for all public services at any point in time for nondisabled and normal range effect groups probably represents a substantial underestimate of both

present and future population cohorts. This will tend to underestimate differences in overall cost between these cohorts and people with autism or PDD who realize partial or minimal treatment effects, but the differences in costs among these groups derive primarily from the use of special education, intensive special education, or adult developmental disability services. SSI costs (the economic supports surrogate cost in the present model) were trended forward at 1.5%, which will also tend to be consistent with more stringent cost containment or limited service eligibility.

At another level, it should also be noted that we used a linear model of EIBI effects, in that gains realized from EIBI by primary school entry were assumed to maintain over the long term. There is no indication that the effects of EIBI are evanescent or ephemeral. On the contrary, existing evidence points to the durability of these effects (McEachin *et al.*, 1993; Perry *et al.*, 1995; Smith, 1998). It is understandable how this can occur if the children enter regular primary school with the skills required to benefit from regular education. The skills and susceptibility to social reinforcement acquired during EIBI would likely be maintained by the contingencies inherent in participation in regular educational, family, and community life. On the other hand, if some children who realize normal range or partial effects from EIBI do not sustain these gains, then our model accommodates this by providing cost and benefit estimates in the range of 20% to 30% normal range effects. The cost–benefits at these levels of outcome remain substantial. However, there is no question that the issues that derive from a simulation can only be resolved effectively by prospective tracking of comparative costs for groups of children over time. Such cost tracking has not been a major focus of research in past analyses of early intervention or preschool services, as is evident by its scarcity in the professional literature.

The Intersection of Cost and Quality

The widely accepted view of autism is that it is a severe lifelong disability (see, e.g., Cohen & Volkmar, 1997; Freeman, 1997; Siegel, 1996). Like effective interventions for other severe or chronic disorders, such as cancer or diabetes, EIBI for autism can be characterized as aggressive and invasive. It most likely does not work well when it is performed piecemeal, briefly, or by individuals with inadequate training and experience. Like effective early intervention for children at risk for various other disabilities, EIBI needs to begin early, be provided for many hours per week and many weeks per year for an extended period, be delivered directly to children, address a wide range of needs, and accommodate individual differences (Guralnick, 1998, Ramey & Ramey, 1998).

In short, EIBI is relatively costly when it is done properly, and even then it does not produce complete recovery in every case.

On what basis, then, can investment in EIBI for children with autism or PDD be justified? A primary consideration is the availability of other interventions that have been demonstrated to produce comparable outcomes in scientifically sound studies. Countless therapies for autism have been touted to produce beneficial effects, ranging from the small to the near-miraculous (Green, 1996a; Gresham & MacMillan, 1997; Klin & Cohen, 1997; Maurice, 1996; Smith, 1993; 1996). Contemporary proponents of various other treatments and critics of EIBI state that other approaches can produce dramatic improvements (e.g., Gresham & MacMillan, 1997; Greenspan, 1992; Koegel, Koegel, Frea, & Smith, 1995; Mesibov, 1997; Strain & Cordisco, 1994), yet there is little empirical support for these assertions from methodologically sound research (i.e., studies that included direct, objective, valid and reliable measurement of treatment effects; demonstrations of improvements in multiple skill areas; controls for alternative explanations; replication; and long-term maintenance of treatment gains; see DeMyer *et al.*, 1981; Green, 1996a; Schreibman, 1988; Smith, 1993; 1996).

Our analysis suggests that another justification for investing in EIBI is long-term monetary savings for families and for society. Today, however, the resources required to begin EIBI are not always readily available. Even when they are, short-term financial and other considerations often force termination of treatment or reduction in treatment intensity sooner than might be optimal (see, e.g., Graff, Green, & Libby, 1998). Some maintain that the limited resources available for EIBI should be invested only in young children with autism or PDD who are most likely to respond dramatically (e.g., Siegel, 1996). We suggest there is not yet an adequate scientific database on which to base either predictions of treatment responsiveness, or decisions to reduce treatment intensity after relatively brief periods.

While the converging evidence from studies of EIBI suggests that it can produce benefits unmatched by other interventions for autism and PDD, careful research is needed to answer a number of burning questions:

Will the 40–50% rates of attainment of normal or near-normal functioning reported in the initial studies hold up in further replication and follow-up studies?

What child and programmatic variables reliably predict responsiveness to EIBI?

What are the long-term outcomes for the children in the initial studies who did not achieve normal functioning?

Might some children like them attain better outcomes with intensive intervention of longer duration, or intervention that incorporates additional well-tested behavior analytic techniques?

How intensive does EIBI have to be to produce optimal effects?

What is the operational definition of 'intensive'?

Do other early intervention models that involve high rates of one-to-one interactions between adults and children with autism (see, e.g., Rogers & Lewis, 1989) produce outcomes comparable to EIBI?

Can biomedical research shed light on the limiting factors that might militate against a large and sustainable outcome, or contribute to the effectiveness of behavioral intervention?

A second, related set of questions pertains to the nature of EIBI and who is capable of delivering this intervention competently. Some have suggested that only individuals who follow the 'Lovaas model' and have been trained directly by the Lovaas clinic at UCLA should be considered qualified (Buch, 1996; Families for Intensive Autism Treatment, 1996). However, other behavior analysts have achieved outcomes comparable to those of Lovaas and colleagues, including normal functioning in some children with autism or PDD (Birnbrauer & Leach, 1993; Maurice, 1993; Perry *et al.*, 1995) and other significant outcomes (Anderson *et al.*, 1987; DeMyer *et al.*, 1981; Fenske *et al.*, 1985; Matson *et al.*, 1996; Maurice, Green, & Luce, 1996; Mulick & Meinhold, 1994).

At present, the number of professional-level applied behavior analysts is far too small to meet the growing demand for behavioral intervention for children with autism of all ages. As a result of the demand and supply imbalance, as well as nationwide pressure stemming from implementation of the federally mandated early intervention infrastructure under P.L. 105–17, a kind of cottage industry has developed; large numbers of individuals are simply proclaiming themselves 'Lovaas therapists', 'behavior analysts', or 'behavioral therapists' and extracting large fees from families and other sources for directing and providing EIBI. Fortunately, actions are being taken on several fronts to attempt to remedy this problem. Legally sanctioned, competency-based procedures for certifying professional behavior analysts that have been in place in the state of Florida for many years (see, e.g., Shook, 1993; Shook & Favell, 1996; Shook & Van Houten, 1993; Shook, Hartsfield, & Hemingway, 1995) are being implemented or considered by several other states at this writing. Representatives of several national professional associations have initiated efforts to establish a specialty and proficiency in applied behavior analysis (e.g., Hopkins & Moore, 1993) for licensed psychologists.

In listening to parents, we have discovered that fewer and fewer wish to trust their children with autism and PDD to unproven fad treatments and inadequately prepared service providers (Jacobson, Mulick, & Schwartz, 1995). Many have become astutely discerning consumers once they have learned the relevant dimensions by which to judge treatment effectiveness and professional

competence (Green, 1996a; Van Houten, 1994). Discerning consumers also recognize that long-term treatment effects are at least as relevant as short-term costs, and that the most expensive treatment is that which is ineffective regardless of the monetary price.

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APPENDIX A: SOURCES OF FINANCIAL INFORMATION FOR PER RECIPIENT EXPENDITURE ESTIMATES—PENNSYLVANIA MODEL

This appendix presents information regarding the sources used in order to develop the estimates used in the cost analysis.

The source for early intervention, family support services, home and community based services waiver estimates, institutional costs, and community services costs is D. Braddock, R. Hemp, L. Bathchelder, & G. Fujiura (1995). *State of the states in developmental disabilities.* Washington, DC: American Association on Mental Retardation.

The source for intensive community services is annual expenditures for six persons or fewer ICF/MR plus one-half of the difference between this amount and the annual institutional expenditure, from Braddock *et al.* (1995), as above.

The source for special education expenditures is average for all special education types from Barnett & Escobar (1990, p. 566).

The source for regular education expenditures is USDOE (1992). *The condition of education* (NCES 92-096), p. 334.

The source for intensive early intervention is the average cost of seven model programs reported by S. Harris & J. Handleman (1994). *Preschool education programs for children with autism.* Austin, TX: PRO-ED.

The source for median household income is the 1990 Federal Census of the United States. Supported wages are indexed at 20% average of median household income for Pennsylvania.

All amounts are trended at 3%, except SSI/ADC (AFCD or TANF) which is trended at 1.5%.

APPENDIX B: ASSUMPTIONS UNDERPINNING THE GENERAL COST MODEL

(i) Current research does not identify characteristics of children with autism or PDD that predict their response to EIBI (e.g., initial I.Q. within the moderate to mild range of mental retardation is not a good predictor) during the years before school entry, funded as either early intervention or preschool services. Thus, benefit must be gauged upon outcomes as identified in the literature (e.g., Smith *et al.*, 1997).

(ii) The proportion of children who achieve normal functioning in all areas is probably somewhat lower than the proportion reported so far in the behavioral research literature (i.e., just under 50%) because (a) in very young children, when severe or profound mental retardation is present, a conclusive diagnosis of autism or PDD may not be made, and (b) other local or nonspecific factors probably affect whether children are diagnosed or, especially, referred for EIBI.

(iii) In any group of children with autism or PDD who receive competently delivered EIBI, between 20 and 50% will achieve normal functioning.

About 40% will achieve substantial gains that will result in reduced dependency on special services, but they will continue to need some specialized services and supports throughout their school and adult lives. Ten percent (10%) will continue to require intensive special education and intensive adult services, and the remainder will evidence benefit sufficient to reduce the intensity of required educational and adult services.

(iv) For these reasons, cost–benefit should be couched in terms of marginal benefit, as well as the attainment of normal functioning. Analyses should encompass comparison of costs for children with autism or PDD who achieve normal functioning with costs for serving children without disabilities, and with costs for serving children with autism or PDD who make large gains but do not move into the normal range. The latter group should also be compared with children who make minimal gains.

(v) Without EIBI the majority of children with autism or PDD will manifest enduring dependency on adult developmental disability services. This is consistent with the literature on child, adolescent, and young adult development for people with autism or PDD.

(vi) The costs of EIBI center-based services for children with autism or PDD (including those with a home-based, parent-directed component) may not be comparable or equivalent, on average, with the costs of EIBI home-based services when instruction is comparably intensive, but relative costs and utilization mix are not well established. The mix of costs for EIBI services used here is assumed to be a representative average for both center-based and home-based services. Future research will be needed to clarify this assumption.

(vii) Children with autism or PDD who ultimately develop normal functioning are assumed to participate in regular education; those who make large gains but not sufficient for them to participate successfully in regular education are assumed to participate in special education; and children who make minimal gains are assumed to participate in intensive special education (or the equivalent from a cost perspective). Special education alternatives (e.g., intensive special education) are assumed to be equivalent in cost regardless of whether they are delivered in segregated, partially integrated, related service, or fully inclusive models, based on requisite instructional load requirements for comparable instructional and educational effects. In short, comparable instruction is assumed to cost the same regardless of whether an inclusive approach is used or not. This is done only in the absence of data indicating a rational basis for assigning such costs in another manner despite the possibility that such data may subsequently emerge.

(viii) Because no generalizable mortality data exist for people with autism or PDD (owing mainly to the advent of the diagnosis in the 1940s and lack of population cohort data), cost–benefit analyses including the adult years are made only to age 55. There is no compelling evidence of marked mortality prior to age 55 years for children surviving to adulthood, and the lifespan of people with autism or PDD may well be similar to that of the general population and appreciably greater than this cutoff age. Therefore, the cutoff point will tend to underestimate adult income from supported or regular employment, utilization of general public entitlements or benefits during adulthood, utilization costs for adult developmental disabilities services, and costs for utilization of aging services and public retirement or income transfer programs for elders.

(ix) Present costs are used as indicators of future costs, with recognition that future reforms in welfare and public health may either result in decreased per person rates or expenditures, or in substitution of services. To compensate, costs have been trended forward at 3% per annum, except for SSI/ADC (Aid for Dependent Children), or the equivalent such as Temporary Assistance for Needy Families (TANF), which is trended at 1.5%. These trend factors probably represent an underestimate of long-term inflationary factors. For example, the average cost inflator for health-related services from 1986 to 1996 was about 4.5%.

(x) SSI/ADC costs are used as a summary cost for all utilization of general public benefits outside of the early intervention, educational, and developmental service sectors (e.g., public housing subsidies, food stamps, child care, temporary assistance, all forms of public assistance, higher-education grants, vocational assistance, public transportation, and Medicaid card services). Although these are not entered as costs for nondisabled children to age 22 years, they are entered as costs for all children with autism or PDD who achieve normal functioning (three years' cost), and partial or minimal effects (18 years' cost). SSI/ADC is also entered as a cost for 33 years to age 55 years for 20% of nondisabled children and children with autism or PDD who achieve normal functioning, and for 100% of children with autism or PDD who make substantial improvements or who benefit minimally.

(xi) The average duration of EIBI is assumed to be three years, a period that is associated in the literature with apparent best outcomes (Green, 1996a). The existing literature suggests that two years of intervention can result in normal functioning for some children, but in this analysis it is recognized that children may participate in 2–6 years of EIBI, and three years is stipulated to be a reasonable average duration.

(xii) Children with autism or PDD who achieve normal functioning are assumed to use family support services during participation in EIBI. Children who make moderate gains and those for whom minimal effects are attained are assumed to use 18 years of family support services, to age 22 years.

(xiii) During adulthood, those who achieve substantial improvements, but not normal functioning, are assumed to use 18 years of Medicaid waiver (or equivalent) services and 15 years of supported work services. During adulthood, for adults for whom minimal effects are obtained, 80% are assumed to use waiver services for 20 years, 20% are assumed to use intensive community services for 23 years, and 40% are assumed to use supported work services for 15 years. These utilization patterns are a function of variations in individual service needs and potential delays between requests for services and service enrollment associated with waiting lists. With the possible exception of adults with whom intervention has been minimally effective during the preschool years, the cost mixes used are lower than those that are presently typical for intensive comprehensive community services for adults with autism or PDD (e.g., ICF/MR and ambulatory clinic services or equivalent levels of care).

(xiv) Supported employment wages are estimated as comparable for individuals with autism or PDD who achieve substantial or minimal gains, at 20% of the median household annual income. It should be noted that although this probably overestimates income (and thus offset of service costs) for people with minimal benefits, it nonetheless reflects a single-person income level that remains below current poverty level indicators, and a full-time employment (40-hour week) hourly rate of $3.24 hourly in the 1996 base year.

(xv) This analysis uses costs reported in several sources for the Commonwealth of Pennsylvania. Annual regular education costs were $7,543 per year in 1996, special education $12,935, and intensive special education $28,806 (from Table 1). The initial annual cost of EIBI is set at $32,820. To calculate the cost–benefit of this intervention set at a higher level of $50,000, readers may simply subtract $53,100 from inflated benefit totals and subtract $51,540 from uninflated benefit totals.

(xvi) Finally, in composite, the service costs and inflators used will tend to underestimate cost slightly relative to current expenditure patterns, whereas the earnings projected will tend to overestimate income slightly, providing a relatively conservative overall estimate of cost–benefit. All savings shown, however, are net of the expense of providing EIBI.

