Algorithm Assessment

Agency Submissions: June-July 2018

Contents

Accident Compensation Corporation

Agency Name	ACC

1. Data Context

Please provide a high-level overview of how your agency collects, analyses and uses data. This should describe (in general terms) how data supports the work of the agency. This should include information about the types of data that the agency collects and uses (not limited to personal information about individuals). Please indicate whether your agency uses data that is collected and/ or controlled by third parties.

This section should ideally be no longer than three or four paragraphs, written for an audience unfamiliar with the work of your agency.

ACC is a social insurer and data is core to all operations, from setting levies (ie premiums), understanding and providing support to customers, and managing third party healthcare providers. ACC provides cover for around 2 million claims per year, at a cost of close to $4 billion. The volume and complexity of the interactions with clients, levy payers and healthcare providers requires detailed data to monitor performance, understand outcomes, enhance customer experience, and continuously improve how we operate.

Information about claimants and their injuries is collected at point of registration to ensure they receive the services they need. Client outcome data is used to understand our performance in rehabilitating individuals, and to identify opportunities to improve performance. Ensuring contractual arrangements with healthcare providers are effective and produce positive outcomes requires collection of transactional and outcomes data.

Levies are collected via NZTA (motor vehicle registration) Inland Revenue (as part of tax collection) and directly from businesses. Inland Revenue provides ACC with data related to tax payers and their taxable income to enable levy collection and to calculate weekly compensation for time off work. Claims information is submitted to ACC by healthcare providers to enable payment of various related services (including medical) and entitlements. ACC provides claims information to Statistics NZ and work related claims information to WorkSafe.

ACC coordinates injury prevention initiatives across a number of agencies such as WorkSafe. ACC claims information and other agency information (such as crash analysis information from NZTA/Police) is used to analyse and inform these initiatives.

Surveys are used to collect information on our customers' experiences and opinions about ACC. This is used to identify opportunities for improvement and ensure our services meet or exceed expectations.

2. Operational Algorithms

The main focus of this review is operational algorithms which impact significantly on individuals or groups. These automated processes interpret or evaluate information (often using large or complex data sets) that result in, or materially inform, decisions which impact significantly on individuals or groups. They may use personal information about the individuals or groups concerned but do not need to do so exclusively.

Also, any algorithms that may incorporate AI or Machine Learning fall into this definition. Decisions made by people (e.g. frontline staff) that are informed by such algorithms are in scope, as are automated decisions.

This review seeks to compile as complete and thorough an overview as possible of these types of algorithms.

2.1 Describe the role of operational algorithms used in decision making.
As completely and thoroughly as possible, describe operational algorithms used by your agency. This should include of the scale and scope of algorithm(s) used, and how they affect, or influence, operational decisions within your agency. This may include a count or estimate of the number of algorithms employed and/or a description by category or function.

Improving client outcomes

ACC uses algorithms based on claims data, built up over many years, to help understand and personalise clients' support needs. This allows ACC to proactively assist those clients who need higher levels of support to return to independence.

Algorithms are primarily used to support the recovery of clients with more complex needs, eg those that require weekly compensation payments.

Combatting fraud, waste and abuse

ACC is transitioning its work to reduce fraud, waste and abuse from a reactive "tip-off based" approach, to one that uses data to proactively identify cases or areas for further investigation.

The fraud, waste and abuse software that ACC will introduce includes elements of machine learning to identify previously unidentified patterns in third party provider behaviours.

2.2 If possible, please include an example or examples for illustration.
Examples might describe a particular algorithm that reflects a larger number of similar processes, from data collection through to decision making, which focus on decisions that impact individuals or groups. Specific assurances and safeguards should be described, and the scale and scope of application noted.

Conversion Probability

This tool calculates the likelihood that a given claim will require actively managed claim support by a case manager. Any claim that meets a given threshold (currently set at [30%]) the client is proactively contacted to see if they require any ongoing support.

Expected Claims Outcome (ECO)

ECO is used at the front line to understand the nature of client needs. This uses historical data to provide case owners with an indication of the likely period of weekly compensation payments for a given injury type for a given client. This is used to rapidly identify clients who are likely to need assistance over and above paying for treatment.

The tool is not a key performance indicator for staff, nor is it used to expedite a client's recovery plan.

Rehabilitation Tracking Tool (RTT)

RTT combines information from ECO with information about clients and their injury to identify those that require additional assistance, eg because their recovery is off track. On average, around 2,000 claims are included in RTT outputs.

RTT is a rule-based tool that collates and presents factual information about a claim.

Financial Impact of Decision (FID)

FID assists case owners in determining the type of assistance that will achieve the best outcomes for the client's situation.. This is primarily used to understand how hardware or equipment can provide greater independence. This tool has limited uptake within our operations.

Smart Services Tool

ACC has a client self-service portal which provides tailored support recommendations directly to customers. For example, it might recommend a shower stool to a person who finds standing difficult or a taxi to someone who can no longer drive into work.

Fraud, waste and abuse

A series of pilot projects focused on third party providers have proven the value of applying a data driven approach to identifying areas of potential fraud, waste and abuse.

For example, a pilot identified a portion of physio providers with unusual invoicing patterns which enabled targeted engagement to understand and mitigate practices that did not meet ACC expectations.

The next stage is implementing comprehensive approach that routinely assesses data to identify outliers for further investigation.

Conversion Probability

This tool calculates the likelihood that a given claim will require weekly compensation. Any claim that meets a given threshold (currently set at [30%]) will have an expected duration of payments calculated via the ECO tool.

Expected Claims Outcome (ECO)

ECO is used at the front line to understand the nature of client needs. This uses historical data to provide case owners with an indication of the likely period of weekly compensation payments for a given injury type for a given client. This is used to rapidly identify clients who are likely to need assistance over and above paying for treatment.

The tool is not a key performance indicator for staff.

Review Tracking Tool (RTT)

RTT combines information from ECO with information about clients and their injury to identify those that require additional assistance, eg because their recovery is off track. On average, around 2,000 claims are included in RTT outputs.

RTT is a rule-based tool that collates and presents factual information about a claim.

Financial Impact of Decision (FID)

FID assists case owners in determining the type of assistance that will achieve the best outcomes for clients with high needs. This is primarily used to understand how hardware and equipment can limit ongoing care costs by providing greater independence. This tool has limited uptake within our operations.

Smart Supports Tool

ACC intends to add a tool to its client self-service portal which will provide tailored support recommendations directly to customers. For example, it might recommend a shower stool to a person who finds standing difficult or a taxi to someone who can no longer drive into work.

Fraud, waste and abuse

A series of pilot projects focused on third party providers have proven the value of applying a data driven approach to identifying areas of potential fraud, waste and abuse.

For example, a pilot identified a portion of physio providers with unusual invoicing patterns which enabled targeted engagement to understand and mitigate practices that did not meet ACC expectations.

The next stage is implementing comprehensive approach that routinely assesses data to identify outliers for further investigation.

2.3 Who designed or created the algorithms described in response to 2.1 and 2.2 (internal staff, external providers?)
It may be helpful to indicate where the agency sought legal advice relating to the design and/or procurement of algorithms.

Algorithms such as the ECO and RTT have been co-developed by internal and external analysts, which combine specific skills and capabilities. Procurement of providers is conducted through the ACC procurement division.

The Smart Services tool is being built by internal staff. The algorithms it leverages are standard statistical methods which have been in use for many years.

The fraud, waste and abuse pilot has been led by ACC's Integrity Services team with support from our technology provider.

2.4 Detail any assurance processes, or related safeguards used in conjunction with algorithms described in response to 2.1.
If the agency has a written policy related to automated decision making or the use of algorithms it may be helpful to cite this along with the role of human intervention and discretion. It may also be helpful to describe the nature of the data sets/ sources that are utilised and any records that are maintained so that the operation of the algorithm can be explained including what information is taken into account for the purposes of making any decisions. Examples of assurance should include data management, oversight, or other governance that support responsible use.

ACC requires all change activities to complete a Privacy Threshold Analysis (PTA). The PTA is used at a high level to:

- identify the potential effects that a project or proposal may have upon the privacy of personal information
- examine how any detrimental effects on privacy might be mitigated.

Where a new activity (which may include an algorithm that uses personal information) has a significant impact on the way information is used, a Privacy Impact Assessment (PIA) is required. The PIA process involves an assessment of the initiative against each of the Privacy Principles, the identification and documentation of any risks and how these are to be mitigated. ACC's Privacy Team complete a response to the PIA, including compliance recommendations. The Privacy Team monitor acceptance and completion of any recommendations that they make.

An Ethics Panel is in place to consider and approve any research, policy or modelling exercise using personal data. The scope of this panel has recently been widened to ensure it is comprehensive and provides guidance from inception through to implementation.

To support growing adoption of algorithm-based tools, terms of reference for a governance group to oversee use of models has been developed. This group will oversee performance and update of models to ensure they meet ethical and privacy standards, continue to achieve expected performance and adapt to changing circumstances.

Algorithms are subject to regular monitoring, review and continuous improvement to ensure they continue to deliver outcomes. For example, the ECO model is reviewed annually to

assess performance against real world outcomes and identify the need for changes to modelling parameters, and has been subject to external scrutiny. We have made extensive information about how the ECO model works available, and clients can request details about how the model used their personal information.

No algorithm currently in use, or planned, is able to generate an adverse decision that affects an individual. Models will exclude gender and ethnicity as predictive variables, unless their inclusion would improve customer experience (for example, when recommending gender-specific equipment).

3. Policy Development and Research

This includes analytical tools used to analyse large and varied data sets to identify patterns and trends and to support policy development or to model potential interventions. The key distinction between these and operational algorithms is that they have no direct or significant impact on individuals or groups. They may inform policy development but have no significant impact on service delivery. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes**.**

3.1 Describe how algorithms are used in policy development and research.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of policy or research that they inform.

Algorithms are not typically used for policy development or research, but analytical techniques are regularly used to identify target populations for injury prevention initiatives. These techniques include cross-tabulation, correlation analysis, logistic regression, and automated segmentation. Historically, segmentations have leveraged the “Mosaic” product from Experian, but moving forward these may be done in house.

3.2 If possible, please include an example or examples for illustration.

ACC’s injury prevention programmes typically analyse the type, frequency, location and cost of injuries experienced, as well as the demographics of the affected group(s). This information is used to develop a set of actions to reduce the impact of these injuries.

4. Business rules

These are simple algorithms created by people that use rules to constrain or define a business activity to make determinations about individuals or groups, without a significant element of discretion. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes.

4.1 Describe the role of operational business rules used in decision making.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of decisions that they inform.

Improving client experience

ACC is developing rules-based algorithms based on claims data, built up over many years, to automate routine decisions at point of claims lodgement. The intent is for a real time cover decision to be made (rather than the current manual process, which takes several days to complete) which allows immediate provision of services a claimant is entitled to, thereby accelerating rehabilitation and return to work or independence. The process will fast-track claims where injuries are relatively simple and clearly caused by an accident. The model cannot decline claims; it can only accept claims or refer them for manual review. Other claims will continue to be reviewed manually by staff, in the same way they are now.

Documentation describing the model and its development process has been published, and a detailed monitoring and review process will support ongoing implementation. This model has been developed in a way that allows users to easily view model parameters, and provide ACC clients with information about model outputs for their claim.

4.2 If possible, please include an example or examples for illustration.

Within the Client Transformation programme, ACC is developing tools that will automatically approve simple claims, identify the type of claim and the likely level of support that clients will need, and stream them to the most appropriate claims management approach.

5. Utility and Future Use

5.1 Describe any benefits or expected impact generated through the use of algorithms described in the previous sections.
It may be helpful to draw on the specific examples provided previously to explain how the analysis or service delivery in question was conducted prior to the application of algorithms, and related analytical tools, in order to quantify any efficiencies or improvements that have occurred as a result.

Since ACC started using the ECO tool, client satisfaction increased from 68% in June 2013 to 78% in September 2017, and the average time taken to set up weekly compensation payments dropped from 11 days in June 2014 to seven days.

We anticipate further improvements in the speed of decision-making as a result of other algorithms under development as part of the Client Transformation. Automating routine tasks will provide clients with faster decisions and generate direct cost savings.

The Smart Services tool will help to ensure clients receive the support they need during their recovery. There may also be benefits in terms of improved customer trust and satisfaction.

5.2 Describe any challenges or risks your agency is managing as a result of the use of algorithms described in the previous sections, including whether any decisions where algorithms have been used have ever been challenged.
As with 5.1, drawing on specific examples may help illustrate or provide context to this answer. Within this response, it would be useful to provide examples of cases where decisions that involved the use of algorithms were challenged.

ACC is confident that our approach has a tangible positive impact on client outcomes, and apply a principle of transparency to all uses of algorithms. We are regularly asked by clients and stakeholders for information about the ECO tool and are able to provide detailed information about the model, its performance, and its application in individual cases.

Use of algorithms to support better client outcomes is an important part of our Client Transformation programme. We are focused on identifying those areas where use of algorithms can further improve client outcomes – either directly or through operational efficiencies – whilst ensuring we continue to meet the expectations of stakeholders and the public.

Our key challenge is to continue to provide transparent information about our approach, and anticipate and resolve concerns raised by the public and stakeholders.

ACC applies the following actions to support development and deployment of any algorithm or predictive model:

- Models are developed in a way that avoids 'black boxes' so we can provide clients with detailed information about how predictive models work, how personal information was used, and the outputs
- Any variables that distinguish clients on the basis of race or gender are excluded (unless inclusion improves customer experience)
- A Privacy Impact Assessment of any use of data in claims management must be completed
- We seek external legal advice to ensure our use of data meets ethical and legal requirements, particularly in relation to the ACC, Privacy and Human Rights Acts
- We seek external technical review of models to ensure they function as intended ahead of deployment
- A monitoring and review framework for each model allows us to track the accuracy of our model, and identify when enhancements need to be made
- We have increased our internal capability to build and maintain predictive models to remove reliance on external expertise (except when necessary)
- We issue proactive communications and release of supporting documentation to help interested parties understand our models.

5.3 Considering the responses to 5.1 and 5.2 how does your agency assess the ongoing utility of algorithms to its current work?

These algorithms are one component of case management, and are always subject to interpretation and use by an ACC staff member. As such, we do not attempt to isolate the specific impact of algorithms. However, since our adoption of the ECO tool, client satisfaction has increased. We also know that these tools provide case owners with important information to help recovery of higher needs clients.

5.4 Does your agency anticipate that further algorithm development is likely to be important to delivering better outcomes in the future?

Predictive analytics to support better client outcomes and service efficiency are core elements of the Client Transformation work programme, and we intend to continue developing such models into the future. These models will fall into 3 main categories:

- Automation of routine low risk decisions to improve operational efficiency, eg automated acceptance of simple claims, workflow management
- Decision support tools to provide insight into client needs and recovery that can be used by case owners, eg likelihood that a claimant will require surgery.
- Client support tools that deliver information directly to clients to support their recovery, eg customised lists of entitlements.

5.5 Does your agency expect to develop operational algorithms that rely on AI (artificial intelligence) or machine learning in the future?

ACC does not intend to apply techniques to any automated process or decision that has can have an adverse impact on a client.

An AI Chatbot proof of concept is underway. The chatbot has been trained to answer common questions raised by business customers during our invoicing period. An evaluation at the completion of the proof of concept will inform a decision on any further rollout.

We do anticipate using machine learning techniques to identify new patterns and trends in our data which we can apply to development of new support tools, and improve the performance of existing tools.

The fraud, waste and abuse system is in early stages of development. It is likely that once fully implemented will include elements of machine learning and AI.

5.6 Does your agency consider that additional cross-government guidance on the creation and use of algorithms would be helpful?

Yes. In particular, some standards or guidance on protection of individuals' data and ethical considerations would help ensure all government activity in this area meets the public's expectations.

5.7 Does your agency consider that it would be useful to be able to seek external, independent, expertise in the creation and use of algorithms?

Yes. External scrutiny is core to ACC's development and use of algorithms, particularly in relation to external legal and technical review of modelling approaches.

Department of Corrections

Agency Name	Department of Corrections

6. Data Context

Please provide a high-level overview of how your agency collects, analyses and uses data. This should describe (in general terms) how data supports the work of the agency. This should include information about the types of data that the agency collects and uses (not limited to personal information about individuals). Please indicate whether your agency uses data that is collected and/ or controlled by third parties.

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At a high-level, this agency collects, analyses and uses a great deal of data. This is primarily in relation to the individual offenders who come under Corrections' management as a result of either custodial remand, being a sentenced prisoner, or as an offender subject to community sentences or orders. Core elements at the individual level include criminal history, current offences, convictions and sentences, demographic data, and other information relevant to the individual's management.

As with any government agency, Corrections also collects data on its general operations, its employees, contractors, volunteers, partner agencies, and so on.

Corrections also uses data that is collected and / or sourced by third parties such as Police and Ministry of Justice (Courts).

7. Operational Algorithms

The main focus of this review is operational algorithms which impact significantly on individuals or groups. These automated processes interpret or evaluate information (often using large or complex data sets) that result in, or materially inform, decisions which impact significantly on individuals or groups. They may use personal information about the individuals or groups concerned but do not need to do so exclusively.

Also, any algorithms that may incorporate AI or Machine Learning fall into this definition. Decisions made by people (e.g. frontline staff) that are informed by such algorithms are in scope, as are automated decisions.

This review seeks to compile as complete and thorough an overview as possible of these types of algorithms.

2.1 Describe the role of operational algorithms used in decision making.

As completely and thoroughly as possible, describe operational algorithms used by your agency. This should include of the scale and scope of algorithm(s) used, and how they affect, or influence, operational decisions within your agency. This may include a count or estimate of the number of algorithms employed and/or a description by category or function.

The only operational algorithm used in decision making within this Department of Corrections is the *Risk of Reconviction / Risk of Re-imprisonment* methodology, generally known as "RoC*RoI". Scores on this measure express the probability that an individual offender will be reconvicted and re-imprisoned for new offending within the following five-year period; scores generated by the measure range between 0.0 and 0.9999.

A score is calculated for all offenders coming under Corections' management. Scores determine whether an offender is categorised as a low- (0.0 – 0.2999), medium- (0.3 – 0.6999) or high-risk (0.7 – 0.9999). This in turn has influence with respect to how the person is managed over the course of their sentence or order. It is <u>one of a number of considerations</u> in relation to:

- level/intensity of management required while on a community sentence
- eligibility for rehabilitation programmes
- prisoner security classification
- suitability for release on parole.

2.2 If possible, please include an example or examples for illustration.
Examples might describe a particular algorithm that reflects a larger number of similar processes, from data collection through to decision making, which focus on decisions that impact individuals or groups. Specific assurances and safeguards should be described, and the scale and scope of application noted.

The algorithm underlying RoCRoI references around 30 individual variables mainly derived from the offender's criminal history. Variables include:

- Current age;
- Sex;
- Age at first offence;
- Frequency of convictions;
- Number of court appearances and convictions;
- Current offence category (10 possible; e.g., violent, sexual, drugs);
- Number of convictions in each crime category.
- Sum of seriousness ratings for all crimes (seriousness defined by average length of sentence in days imposed by offence type);
- Weighted past seriousness measure (places greater weight on seriousness of most recent offence);
- Maximum serious measures for the past time period;
- Mean seriousness measures for the past time period.
- Number of previous imprisonment sentences;
- Maximum sentence length handed down to offender in past (years);
- Total estimated time (years) spent in prison;
- Time at large (length of offender's most recent time at large).

These variables are extracted from the criminal history and converted by the algorithm into the risk score. Ethnicity is not a variable in the algorithm.

The algorithm is contained within Corrections' Integrated Offender Management System, its main operational database. A score can be calculated for any individual within that database by a simple "press of a button"..

2.3 Who designed or created the algorithms described in response to 2.1 and 2.2 (internal staff, external providers?)
It may be helpful to indicate where the agency sought legal advice relating to the design and/or procurement of algorithms.

The assessment methodology was developed in 1995 in a joint venture between Corrections' Psychological Services and the Mathematics and Statistics Department at the University of Canterbury. In developing the method, these staff followed principles used in the for design of similar risk measures already developed in correctional services of several other countries, including Canada, The United Kingdom, and The United States.

7.4 Detail any assurance processes, or related safeguards used in conjunction with algorithms described in response to 2.1.
If the agency has a written policy related to automated decision making or the use of algorithms it may be helpful to cite this along with the role of human intervention and discretion. It may also be helpful to describe the nature of the data sets/ sources that are utilised and any records that are maintained so that the operation of the algorithm can be explained including what information is taken into account for the purposes of making any decisions. Examples of assurance should include data management, oversight, or other governance that support responsible use.

The use of RoCRoI scores in guiding offender management is governed by principles represented in various practice frameworks (separately tailored for and available to Case Managers, Probation Officer, Psychologists). All staff working directly with offenders are expected to understand and adhere to the principles contained in their practice frameworks.

Risk scores generated by the RoCRoI algorithm can be subject to "professional override' in cases where the case manager, Probation Officer or psychologist believes that additional information not captured by the actuarial risk method is available and which indicates that the risk score is not representative of the real level of risk posed by an offender. As a result, an offender's risk assessment may change, for example, from "medium" to "high', or *vice versa*.

8. Policy Development and Research

This includes analytical tools used to analyse large and varied data sets to identify patterns and trends and to support policy development or to model potential interventions. The key distinction between these and operational algorithms is that they have no direct or significant impact on individuals or groups. They may inform policy development but have no significant impact on service delivery. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes**.**

3.1 Describe how algorithms are used in policy development and research.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of policy or research that they inform.

Minor – one example, as below.

3.2 If possible, please include an example or examples for illustration.

Algorithms are a feature of propensity-score matching procedures, which are in turn a feature of our annual rehabilitation programmes outcome evaluation method ("Rehabilitation Quotient"). This method uses logistic regression techniques in order to quantify the impact of programme participation on rates of reconviction and reimprisonment amongst offenders who have participated in rehabilitation programmes.

9. Business rules

These are simple algorithms created by people that use rules to constrain or define a business activity to make determinations about individuals or groups, without a significant element of discretion. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes.

4.1 Describe the role of operational business rules used in decision making.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of decisions that they inform.

Nil

4.2 If possible, please include an example or examples for illustration.

10. Utility and Future Use

5.1 Describe any benefits or expected impact generated through the use of algorithms described in the previous sections.
It may be helpful to draw on the specific examples provided previously to explain how the analysis or service delivery in question was conducted prior to the application of algorithms, and related analytical tools, in order to quantify any efficiencies or improvements that have occurred as a result.

Risk assessment for the purposes of informing offender management and service delivery was previously conducted on the basis of manual assessments, involving largely clinical considerations. This approach Is time-consuming, prone to error, and meant that a great many individuals were never assessed. Thus an automated actuarial assessment tool has created great efficiencies as a result, leading to infinitely more efficient service delivery.

5.2 Describe any challenges or risks your agency is managing as a result of the use of algorithms described in the previous sections, including whether any decisions where algorithms have been used have ever been challenged.
As with 5.1, drawing on specific examples may help illustrate or provide context to this answer. Within this response, it would be useful to provide examples of cases where decisions that involved the use of algorithms were challenged.

There have been instances where RoCRoI assessment results have been challenged legally, particularly in the context of the Parole Board, where scores above 0.7 lead to designation as a high-risk offender, which in turn creates expectations around completion of high-intensity rehabilitation programmes. However, all such challenges have been resolved without any judicial criticism of Corrections' risk assessment methodology.

Aspects of the tool and its use, particularly in relation to Maori offenders, were tested in a 2004 Waitangi Tribunal (WAI 1024) hearing into Corrections' assessment procedures. The Tribunal made no adverse findings in relation to the RoCRoI tool, other than in relation to failing to consult with Maori during its development; see https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_68001752/Offender%20Assessment%20Policies.pdf
5.3 Considering the responses to 5.1 and 5.2 how does your agency assess the ongoing utility of algorithms to its current work?
The current actuarial assessment tool RoCRoI is critically important to Corrections' operations, and is likely to remain a feature of its offender management frameworks for the foreseeable future.
5.4 Does your agency anticipate that further algorithm development is likely to be important to delivering better outcomes in the future?
We have no current plans, but can envisage a range of situations within current offender management processes where future technological advances in the future may well mean that algorithm development serves to deliver better outcomes.
5.5 Does your agency expect to develop operational algorithms that rely on AI (artificial intelligence) or machine learning in the future?
No current plans, but as above in 5.4.
5.6 Does your agency consider that additional cross-government guidance on the creation and use of algorithms would be helpful?
No current perceived need for this.
5.7 Does your agency consider that it would be useful to be able to seek external, independent, expertise in the creation and use of algorithms?

No current perceived need.

Department of Internal Affairs

Agency Name	Department of Internal Affairs

1. Data Context

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Service Delivery

Types of data we collect

- Personal details including; life event records (e.g. Births, Deaths, Marriages, Civil unions, Name changes, Adoptions, HART information, citizenship details)
- Address and contact details (e.g. past, present, physical locations and electronic contact information)
- Identifying characteristics (e.g. height and eye colour, gender, face)
- Financial statements and governance documentation relating to charitable organisations and community groups.

We use data that is collected by other agencies or persons in order to cross reference and update life event registration information (e.g. maternity carers, marriage celebrants, and funeral directors). The cross-referencing process can add rigour to registration processes.

We use data to identify applicants and to establish their eligibility for products and services.

We also have access to data collected and controlled by third parties (e.g. information held by Immigration New Zealand is accessed as part of the Citizenship eligibility assessment).

Regulatory Services

Types of data we collect:

- annual report data received from regulated entities
- Gambling data to help inform licensing decisions/renewals
- Gambling data and open source information to determine higher risk gambling venue for compliance audit or inspection

Policy Development

We also collect data from Stats NZ and local councils to inform policy advice, however this data is not used in algorithms to inform decision making.

2. Operational Algorithms

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As are all regulators, we are building our capability to carry out risk identification and analysis in order to target our regulatory efforts and resources to the highest risk issues and sectors. In the sense that the term has been used in recent media coverage, we do not use algorithms for this purpose.

We looked at the categories of algorithm use, profiling and automated algorithms (based on those in the General Data Protection Regulation and the report of the recent UK House of Commons inquiry Algorithms in decision- making) and found examples using algorithms in facial recognition testing, risk assessments for passports and passport renewal applications. First time applicants all require some degree of manual processing.

Passport applications

All passport applications are automatically approved provided they pass over 140 checks. This includes checking against previous passport data and the identity referee's passport. If the application fails a check it is referred to passport staff to be manually processed. Approximately 40% of passport renewals are automatically approved, reasons for an application being referred for manual processing include: misspelling or payment being declined. First time applicants all require some degree of manual processing.

Passports Facial Recognition

To establish the identity of an applicant all passport photos undergo automated facial recognition testing. Photographs submitted with applications are compared to photos held in the passports database. If an exception is detected the photo is then manually checked by passports staff.

Passports Risk Algorithm

All Passport applications are automatically assessed against identified risk factors. Applications that meet the risk threshold are referred to passport staff and processed manually.

Regulatory Services

- Regulatory Services utilises three tools that could be classified as using algorithms.
    - AML – AMULET – entity risk model : Uses annual report data received from regulated entities which are scored to help determine entity risk
    - Gambling – RAT – Risk Assessment Tool – Uses Gambling data to help inform licensing decisions/renewals

- Gambling – Visit – Uses Gambling data and open source information to determine higher risk gambling venue for compliance audit or inspection
- The algorithms help determine if/how we engage with a particular regulated company or individual
- Any findings are incorporated into the tool using the algorithm
- Identifying risk based on data collected from both the regulated entity and external sources (both companies and individuals)

Birth registration reminder letters: To enable birth registration reminder letters to be sent to parents who have not registered a birth. Notice of birth information is matched against birth registrations. Birth registrations that cannot be matched automatically are manually matched by Registrars.

Citizenship by birth*:* To determine the citizenship by birth status of a child born in NZ. Parent identity records are matched to the child. If a match is not made automatically, it is passed on for manual intervention..

Death registration
Deaths are matched to birth records so that any birth certificate subsequently issued will record the fact that the subject is now deceased. If a match is not made automatically, it is passed on for manual intervention.

2.2 If possible, please include an example or examples for illustration.
Examples might describe a particular algorithm that reflects a larger number of similar processes, from data collection through to decision making, which focus on decisions that impact individuals or groups. Specific assurances and safeguards should be described, and the scale and scope of application noted.

Passport applications
An example in this area is where an algorithm checks that key identity information provided on the renewal application matches the information provided and verified previously about an individual. Lack of sufficient matching may lead to manual processing being required to enable more scrutiny of the application. In first time applications the absence of information will lead to manual processing.

Passports Facial Recognition
For renewal applications the algorithm seeks to complete an automated match between two different photographs therefore confirming that the person is one and the same Where a match is not made, further manual assessment of the photographs and the application as a whole are completed. For first time applications an automated comparison is made to other images in the database to assess whether the face matches to a different identity already in the database. As the checks are intrinsic to the security of the Passport document, a high level summary has been provided here only.

Passports Risk Algorithm
This algorithm operates just like all of the other checks, i.e. there is no automatic adverse action taken any flagged application is referred for human decision making.

Birth registration reminder letters
Hospitals and midwives are required to provide preliminary notice of birth information to DIA within 5 working days of a birth in NZ. If the parents haven't registered the baby's birth within 28 days, a reminder letter is sent to the mother from the notice of birth information advising them of how to register their childs birth. Birth registration is an important enabler for parents which helps them to gain access to financial support and social services. A matching programme attempts to match the notice of birth information to birth registration

each night. If there is a 1:1 match between certain fields in the birth notice and birth registration (e.g. mother's name), the birth notice will automatically linked to the birth registration in order to prevent the reminder letter being issued. For any birth registrations that cannot be automatically matched to a birth notice, a Registrar will search the notice of birth to find a match. A birth registration will not be matched until it is matched to a notice of birth.

Citizenship by birth
Determination as to the citizenship by birth status of a child born in NZ has occurred since 1 January 2006. The citizenship status is recorded on the child's birth registration and birth certificate, In determining whether a person's birth record states they are a New Zealand citizen, the child's parents' are matched to their birth registration record, and/or Citizenship/Residency record, and/or Passport record. If the parent matches to an identity record that confirms their New Zealand citizenship then the child's birth record is updated with the appropriate citizenship status. If a parent provides information that implies that the child is entitled to be a NZ citizen by birth and that information cannot be verified by DIA, an adverse action process commences that provides the parent with the opportunity to provide further information.

Death registration
Birth certificates are required by legislation to show (where applicable) that the subject is deceased. When a death is registered an attempt is made to match it to a NZ birth record. Similarly, when a birth is registered an attempt is made to match it to a NZ registered death. Only records that are registered in NZ can be matched. A Registrar will only link a birth to a death record when, in their professional judgement, the records relate to the same individual. Updating records in this way enables the registries relating to life events to be kept up to date, with death registrations helping to prevent identity fraud occurring.

2.3 Who designed or created the algorithms described in response to 2.1 and 2.2 (internal staff, external providers?)
It may be helpful to indicate where the agency sought legal advice relating to the design and/or procurement of algorithms.

Passport Renewal
Staff from within the Department work closely with vendors/external providers on any algorithm proposed/enacted.

Passport Facial Recognition
Staff from within the Department work closely with vendors/external providers on any algorithm proposed/enacted.

Passports Risk Algorithm
Staff from within the Department designed and set the parameters for the algorithm with this being enacted by internal and/or external vendors/providers.

Regulatory Service
Internal staff

Birth registration reminder letters
Staff from within the Department designed the matching procedure with this being enacted by external vendors/providers.

Citizenship by birth
Staff from within the Department designed the matching procedure with this being enacted by external vendors/providers.

Death registration
Staff from within the Department designed the matching procedure with this being enacted by external vendors/providers.

Any decisions on risk tolerances and calibration of system based processes are always approved by DIA staff before they are operationalised

2.4 Detail any assurance processes, or related safeguards used in conjunction with algorithms described in response to 2.1.

If the agency has a written policy related to automated decision making or the use of algorithms it may be helpful to cite this along with the role of human intervention and discretion. It may also be helpful to describe the nature of the data sets/ sources that are utilised and any records that are maintained so that the operation of the algorithm can be explained including what information is taken into account for the purposes of making any decisions. Examples of assurance should include data management, oversight, or other governance that support responsible use.

Passport Applications
See earlier commentary –. Where an application fails any check human intervention occurs prior to any decisions being made.

Passport Facial Recognition
See earlier commentary. Where an application fails a facial recognition check, human intervention occurs prior to any decisions being made.

Passport Risk Algorithm
See earlier commentary –. As with all of the automated checks where an application fails the automated risk check human intervention occurs prior to any decisions being made.

Regulatory Services
- Licensing and compliance decisions made using the algorithms still have to go through review process(es) with managers
- Risk factors periodically are reviewed
- Information inputs are evaluated for accuracy and changed accordingly if errors are found

Birth registration reminder letters
When a match cannot be made human intervention occurs

Citizenship by birth
If a match is not made automatically, human intervention occurs

Death Registration.
If a match is not made automatically, human intervention occurs

3. Policy Development and Research

This includes analytical tools used to analyse large and varied data sets to identify patterns and trends and to support policy development or to model potential interventions. The key distinction between these and operational algorithms is that they have no direct or significant impact on individuals or groups. They may inform policy development but have no significant impact on service delivery. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes**.**

3.1 Describe how algorithms are used in policy development and research.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of policy or research that they inform.

N/A

3.2 If possible, please include an example or examples for illustration.

N/A

4. Business rules

These are simple algorithms created by people that use rules to constrain or define a business activity to make determinations about individuals or groups, without a significant element of discretion. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes.

4.1 Describe the role of operational business rules used in decision making.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of decisions that they inform.

The department has a large number of business rules that both underpin business systems and decision making processes in our service delivery and regulatory systems. An example of one such rule would be in the passports area once an application gets to a case officer. It is assessed and may be recommended for approval; then it is forwarded automatically on to a second person to look at the application with a fresh set of eyes to assess, before the application is approved. The business rule means that the first and second checker can't be the same person.

4.2 If possible, please include an example or examples for illustration.

See above.

5. Utility and Future Use

5.1 Describe any benefits or expected impact generated through the use of algorithms described in the previous sections.
It may be helpful to draw on the specific examples provided previously to explain how the analysis or service delivery in question was conducted prior to the application of algorithms, and related analytical tools, in order to quantify any efficiencies or improvements that have occurred as a result.

Passport applications
The use of algorithms supports better utilisation of workforce, as it enables higher levels of scrutiny to be applied to applications which may carry more risk/are less straight-forward. However, the benefits relate to overall improved effectiveness of the Passports processing systems, as opposed to specific efficiencies being identified.

Passport Renewal
The use of algorithms supports better utilisation of workforce, as it enables higher levels of scrutiny to be applied to applications which may carry more risk/are less straight-forward. However this is only one aspect of a suite of improvements made in the Passports processing system. Overall benefits relate to overall improved effectiveness of the Passports processing systems, as opposed to specific efficiencies being identified. As demand for passports increases, any efficiency created across the system as a whole is redirected into providing better customer service, or may be realised as part of a push to reduce our overall cost to serve.

Passports Risk Algorithm
The passport risk algorithm enables the use of a more complex, and therefore more accurate, assessment tool. It is applied automatically which means that the assessment tool is applied consistently and quickly.

5.2 Describe any challenges or risks your agency is managing as a result of the use of algorithms described in the previous sections, including whether any decisions where algorithms have been used have ever been challenged.
As with 5.1, drawing on specific examples may help illustrate or provide context to this answer. Within this response, it would be useful to provide examples of cases where decisions that involved the use of algorithms were challenged.

Passport applications
No specific changes at this time – we are continually looking at how we can improve our systems and provide better services to customers, however improvements may arise from a range of areas (e.g. improved analytics, improved technology, changes in overseas security standards).

Passport applications
As part of our commitment to New Zealanders, and as an active member of ICAO (international Civil Aviation Organisation), we continue to look at how we can improve the security and integrity of the Passports product. That means looking at new technology offerings and understanding how New Zealanders may travel and/or use an identity product in the future. Future improvements may rely on algorithms in the future, but they may also be eclipsed by new technology offerings. We have no specific challenge in relation to algorithms at this time.

Passports Risk Algorithm

As with all of our automated checks we are continually looking at how we can improve our systems to provide greater efficiency and or accuracy.

5.3 Considering the responses to 5.1 and 5.2 how does your agency assess the ongoing utility of algorithms to its current work?

Please see notes above – no further comment at this time.

5.4 Does your agency anticipate that further algorithm development is likely to be important to delivering better outcomes in the future?

Please see notes above – we are continually looking at how we can improve our systems.

Death registration
Notice of death: Subject to the passing of legislation, doctors may be required to provide preliminary cause of death information ("notice of death") to DIA within 3 working days of a death in NZ. DIA will be able to use the notice of death information to ensure the completeness of the death register. The person in charge of the disposal of a body is required to register the death within 3 working days of disposal. DIA will match notices of death to death registrations. There will be an investigation into any notices of death that cannot be matched to a corresponding death registration to ensure compliance with legislation. The legislation is expected to be passed in 2019.

5.5 Does your agency expect to develop operational algorithms that rely on AI (artificial intelligence) or machine learning in the future?

We are open to any new developments to improve the efficiency and accuracy of our systems and this could include AI or machine learning however there no specific plans in place to do so.

Please see notes above – no further comment at this time.

5.6 Does your agency consider that additional cross-government guidance on the creation and use of algorithms would be helpful?

Yes, to the extent that protecting the rights of individuals under the Privacy Act 1993 is of importance, and the use of algorithms for public good clearly intersects with these rights.

Having clarity of expectation, risks, and possible areas which need to be managed as part of the development of algorithms would be of benefit to ensure that an appropriate balance of needs is established.

5.7 Does your agency consider that it would be useful to be able to seek external, independent, expertise in the creation and use of algorithms?
We already use external independent expertise in the area of facial recognition technology. We also discuss all of our automated systems with various members of the international travel document community. Depending upon the nature of the algorithm and whether it is used to determine eligibility to receive a product or service versus where it is used to enable the better management of applications (i.e. as a workflow tool) will influence the value of additional external advice. In some areas (such as Passports) there may be security risks associated with seeking such advice outside of key stakeholders with whom we already have existing relationships.

Inland Revenue

Agency Name	Inland Revenue

1. Data Context

Please provide a high-level overview of how your agency collects, analyses and uses data. This should describe (in general terms) how data supports the work of the agency. This should include information about the types of data that the agency collects and uses (not limited to personal information about individuals). Please indicate whether your agency uses data that is collected and/ or controlled by third parties.

This section should ideally be no longer than three or four paragraphs, written for an audience unfamiliar with the work of your agency.

Inland Revenue (IR) plays a critical role in improving the economic and social wellbeing of New Zealanders. IR collects 80% of the Crown's revenue as well as collecting and disbursing social support programme payments and providing the government with policy advice.

IRs multi-year Business Transformation programme is tasked with enabling an intelligence-led, customer centric, agile organisation.

To this end, Inland Revenue collect, analyse and hold data that is relevant and necessary to administering the tax laws of New Zealand; effectively ensuring tax obligations are met by Customers and social policy entitlements and payments are met by Government.

Data is collected directly from customers of the products or services, as well as from intermediaries (eg tax agents) and other third parties. This includes other Government agencies as well as non-government entities.

Data is also collected and analysed as part of the identification of undeclared, fraudulent or serious criminal behaviours. Requests for data are made on the basis that the data will be of use to apply tax administration law or improve policy making decisions / design.

A critical enabler for IR in this regard is entity resolution. Entity Resolution is a model that enables the identification of instances where a single real-world entity is represented multiple times in the data. The model helps IR to generate a more accurate data representation and enables the integration of multiple datasets – giving a more accurate customer-centric view of the world. This is absolutely core to any analytical endeavour IR has. Entity Resolution is the core technology enabling IR's "Graph Fusion" solution – a programmatic approach to detect and prioritise hidden economy tax risk.

2. Operational Algorithms

The main focus of this review is operational algorithms which impact significantly on individuals or groups. These automated processes interpret or evaluate information (often using large or complex data sets) that result in, or materially inform, decisions which impact significantly on individuals or groups. They may use personal information about the individuals or groups concerned but do not need to do so exclusively.

Also, any algorithms that may incorporate AI or Machine Learning fall into this definition. Decisions made by people (e.g. frontline staff) that are informed by such algorithms are in scope, as are automated decisions.

This review seeks to compile as complete and thorough an overview as possible of these types of algorithms.

2.1 Describe the role of operational algorithms used in decision making.
As completely and thoroughly as possible, describe operational algorithms used by your agency. This should include of the scale and scope of algorithm(s) used, and how they affect, or influence, operational decisions within your agency. This may include a count or estimate of the number of algorithms employed and/or a description by category or function.

To administer the tax system the 'law' and associated calculations have been turned into an 'automated decision / algorithm'. These facilitate by product how much $payments are received by customers and paid out by govt. There will be hundreds of these decisions being calculated across the core transactional system at any one time: START (and currently FIRST). These types of processes have been in place for multiple years and are administered and monitored as part of tax law application and embedded technology review processes.

Other operational algorithms that IR uses relate to proactive customer contacts, for example:

1) We can identify irregularities in payments schedules, returns, amounts, circumstances.
2) We can identify fraudulent or criminal relationships / networks.
3) We can identify an opportunity to support the customer process by offering additional information as part of the overall customer experience.

In points 1 and 2 above, the outputs are provided to Investigators to screen and determine if further investigation is required.

2.2 If possible, please include an example or examples for illustration.
Examples might describe a particular algorithm that reflects a larger number of similar processes, from data collection through to decision making, which focus on decisions that impact individuals or groups. Specific assurances and safeguards should be described, and the scale and scope of application noted.

Example 1.

Automatic refunds operational algorithm. This process is designed to improve the customer experience and contribute to reducing the cost of collection and cost of compliance over time. "Income reported in the current year (submissions) is compared to previous year (reported). Where there is reasonable certainty on the income reported and the customer is tax positive then an automatic refund will be given. Where the system is not satisfied, the taxpayer will be asked to complete a new return to verify. These sorts of algorithm represent the decisions that are applied in the core transactional system START.

2.3 Who designed or created the algorithms described in response to 2.1 and 2.2 (internal staff, external providers?)
It may be helpful to indicate where the agency sought legal advice relating to the design and/or procurement of algorithms.

Example 1. In such cases the rules are designed by Policy teams, Parliament endorse and operational teams within IR design the practices to enact the rules. This includes a continuous process: systems that people code, test, validate and release the algorithms to production.

As part of the broader intelligence-led ambition, IR also has a hub and spoke organisation design around its analytics capability. What this means is that the vast majority of complex or customer facing analytics are designed by a core team of analytics and data science

practitioners. This team reports into the Information and Intelligence Services division led by a Deputy Commissioner. These people will work directly with Subject Matter Experts and Policy teams, amongst others, to identify appropriate use cases, data sources and analytical solutions. With a collaborative process of discovery, design, build and deploy the analytics teams are responsible for testing, validating and maintaining the data and analytical models that are deployed to users.

2.4 Detail any assurance processes, or related safeguards used in conjunction with algorithms described in response to 2.1.

If the agency has a written policy related to automated decision making or the use of algorithms it may be helpful to cite this along with the role of human intervention and discretion. It may also be helpful to describe the nature of the data sets/ sources that are utilised and any records that are maintained so that the operation of the algorithm can be explained including what information is taken into account for the purposes of making any decisions. Examples of assurance should include data management, oversight, or other governance that support responsible use.

There is no global documentation across IR as to how this works currently.
IR recognises that the governance practices around data and analytics can be improved. IR has recently procured a modern data and intelligence platform as part of its Business Transformation programme. Part of the work programme scope to is to put in place best practice data and analytics governance across people, process and technology as an enabler.

3. Policy Development and Research

This includes analytical tools used to analyse large and varied data sets to identify patterns and trends and to support policy development or to model potential interventions. The key distinction between these and operational algorithms is that they have no direct or significant impact on individuals or groups. They may inform policy development but have no significant impact on service delivery. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes**.**

3.1 Describe how algorithms are used in policy development and research.

Please provide an indication of the scale and scope of algorithm(s) used and the kinds of policy or research that they inform.

Inland Revenue administers most of the New Zealand tax system, and also a large number of social policies. Tax and social policy changes can occur on a number of topics, for example on the tax base, on entitlements, on the tax parameters (rates and thresholds) and on the administration (for example penalties and interest, frequency and timing of payments, square up obligations). The Policy and Strategy teams advise the government on changes to these policy settings.

Data analysis is used extensively to inform policy advice. Data is used to examine the materiality of the issue; for example the number of affected taxpayers and the amount of money involved. Any suggested changes to the policy settings require estimation of the likely fiscal costs or savings arising from the change. These fiscal estimates ultimately feed into Budget forecasts once the policy change decisions are taken. Policy cost analysis makes use of both external (aggregate) and internal (unit record) Inland Revenue data. Even though the data source may at times be unit record, the results are invariably national aggregates; for example "the fiscal cost of policy action YY is $ZZ million per year".

3.2 If possible, please include an example or examples for illustration.

The algorithmic use of the data can vary. Some examples are:

- data analysis to scope the size of a policy issue – for example how many taxpayers are impacted under the status quo?
- data analysis to inform an assumption in a model - for example, calculating an average tax rate to then apply to aggregated data in a separate model
- simulating a policy change at the taxpayer level and adding up the results – for example, microsimulation of the impacts of a tax scale change
- data analysis to examine the overlaps of multiple aspects of the tax system – for example looking at the distribution of effective marginal tax rates across the tax/benefit interface

Data analysis is also used to inform forecasts. Aggregate tax can be monitored against economic variables where available, but the monitoring analysis can dig more deeply than this. For example we might be interested in trends in dividend payment behaviour, in losses, or in the use of different entity structures or remuneration behaviours (many of which have the potential to move revenue from one tax type to another). For forecasting and policy purposes, we are always looking for such "big picture" trends. Understanding what is going on is a key ingredient to understanding whether the policy settings are correct.

4. Business rules

These are simple algorithms created by people that use rules to constrain or define a business activity to make determinations about individuals or groups, without a significant element of discretion. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes.

4.1 Describe the role of operational business rules used in decision making.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of decisions that they inform.

Most of the operation algorithms that reflect *example 1* are business rules that have been applied and automated.

Other types of business rules are predominantly applied to customer campaigns where we are looking to create audience types to receive similar communications. These could be used to inform or advise of upcoming changes that might affect the customer.

4.2 If possible, please include an example or examples for illustration.

As above.

5. Utility and Future Use

5.1 Describe any benefits or expected impact generated through the use of algorithms described in the previous sections.
It may be helpful to draw on the specific examples provided previously to explain how the analysis or service delivery in question was conducted prior to the application of algorithms, and related analytical tools, in order to quantify any efficiencies or improvements that have occurred as a result.

Beyond the transactional application of algorithms in START that enact the tax system, the primary purpose for information collection and analysis is for understanding customers and the opportunities and risks to the tax base.

The information, whether from internal or external sources, can take a considerable time to process. There is a great deal of work and data engineering that will go into the data even before starting any of the analysis. Even after this work is complete, developing and building models and testing them can takes months.

Part of this work is understanding what the data means, and what any of the results of the models mean, and this involves many teams within IR, including business experts and frontline staff.

Once this work is complete, IR may develop a model which can then identify, quantify and validate assumptions, or which can identify customers with identified needs or risks. Any output from these models has several processes of scrutiny, including the final process of a package of information passing to SMEs who will then decide what the appropriate response is.

Data quality is a significant determinant of Analytics capability, which has a direct impact on the enterprise's ability to make good decisions. A core challenge to data quality is where the data has multiple representations of the same real-world entity – the technology solution to this is known as entity resolution (ER). Within the domain of tax administrations the accuracy of ER is especially important and so Inland Revenue has invested in developing its own ER model, and benchmarked this model against vendor solutions. The development of a high performing ER model has then enabled high quality data and the fusion of disparate datasets.

5.2 Describe any challenges or risks your agency is managing as a result of the use of algorithms described in the previous sections, including whether any decisions where algorithms have been used have ever been challenged.
As with 5.1, drawing on specific examples may help illustrate or provide context to this answer. Within this response, it would be useful to provide examples of cases where decisions that involved the use of algorithms were challenged.

To date, we have had minimum identified risk or concerns about the algorithms that are deployed at IR to adversely affect a customer outcome.

As the possibility to use data and the technologies that can be applied to data and analytics become more powerful, IR is conscious of the need to ensure that how it ingests, manages and utilises data and analytics are appropriately governed and that algorithms that enable customer outcomes are appropriately monitored and trained.

5.3 Considering the responses to 5.1 and 5.2 how does your agency assess the ongoing utility of algorithms to its current work?

Algorithms are a core part of modern day business. The ongoing conversation globally around AI, has muddied the understanding and application of automated decision making. IR considers that with the right governance models in place and the application of contextual human decision making (ie review development of new applications / use cases) informed and well understood decisions that utilise new algorithms can be made that will benefit the NZ govt and tax payers.

Humans will need to continue to complement the tasks performed by the adoption of any new 'cognitive technology', ensuring that the work of machines is both effective and responsible — that it is fair, transparent, and auditable.

IR therefore recognises that the broad range of technical and business skills and roles of IR people will need to enhance and adapt to support this global shift.

5.4 Does your agency anticipate that further algorithm development is likely to be important to delivering better outcomes in the future?

Yes. This is a global change that is occurring.

5.5 Does your agency expect to develop operational algorithms that rely on AI (artificial intelligence) or machine learning in the future?

Yes this is something that IR will consider development of in time. However, the greatest importance needs to be placed at analytics and data management / governance processes. Without a strong practice and embedded culture in this regard it would be hard to deliver future business value without incurring unnecessary cost or business risk.

5.6 Does your agency consider that additional cross-government guidance on the creation and use of algorithms would be helpful?

Working within a consistent framework and sharing of understanding across government agencies would be beneficial. Guidance needs to be practical, evolutionary and adaptive. It is important that an ongoing conversation is happening and shaped by understanding and learnings in the work we all undertake.

5.7 Does your agency consider that it would be useful to be able to seek external, independent, expertise in the creation and use of algorithms?

Any such discussion needs to happen with a tighter reference to what is meant by algorithms. The spectrum for application is wide and open to interpretation. It encompasses much broader conversations that affect decisions around data use, analytics application, privacy and ethics etc.

Ministry of Business, Innovation and Employment (Including Immigration New Zealand)

Agency Name	Ministry of Business Innovation and Employment (MBIE)

1. Data Context

Please provide a high-level overview of how your agency collects, analyses and uses data. This should describe (in general terms) how data supports the work of the agency. This should include information about the types of data that the agency collects and uses (not limited to personal information about individuals). Please indicate whether your agency uses data that is collected and/ or controlled by third parties.

This section should ideally be no longer than three or four paragraphs, written for an audience unfamiliar with the work of your agency.

The Ministry of Business, Innovation and Employment (MBIE) is the government's lead business-facing agency. Our purpose is to grow the New Zealand economy to provide a better standard of living for all New Zealanders.

MBIE is responsible for a variety of significant government data assets, for analytical leadership across diverse areas, and for operational analytics to support regulation. MBIE's data assets reflect its wide range of regulatory, operational and policy functions. Data assets include official registries, transactional data, corporate operational data and analytical data collected for research and analytics. For example, MBIE:

- maintains New Zealand's official business registers, intellectual property registers, motor vehicle traders register and radio frequencies register, among others;
- is the official steward for New Zealand's petroleum and minerals data, collected by permit holders and the government;
- generates transactional data in support of operational functions like immigration, for example when processing visa applications;
- collects primary research data through surveys such as the international visitor survey and electricity price survey.

To support its functions, MBIE also has various data matching/sharing agreements with other agencies:
https://www.privacy.org.nz/privacy-for-agencies/information-sharing/operating-matching-programmes-2/

MBIE has significant analytical capability to support its policy development and evaluation in support of its Ministers and their portfolios. MBIE has analytical capability in operational intelligence to support enforcement of its regulatory functions. MBIE also uses data to understand its customers' needs and provide better customer services.

2. Operational Algorithms

The main focus of this review is operational algorithms which impact significantly on individuals or groups. These automated processes interpret or evaluate information (often using large or complex data sets) that result in, or materially inform, decisions which impact significantly on individuals or groups. They may use personal information about the individuals or groups concerned but do not need to do so exclusively.

Also, any algorithms that may incorporate AI or Machine Learning fall into this definition. Decisions made by people (e.g. frontline staff) that are informed by such algorithms are in scope, as are automated decisions.

This review seeks to compile as complete and thorough an overview as possible of these types of algorithms.

2.1 Describe the role of operational algorithms used in decision making.

As completely and thoroughly as possible, describe operational algorithms used by your agency. This should include of the scale and scope of algorithm(s) used, and how they affect, or influence, operational decisions within your agency. This may include a count or estimate of the number of algorithms employed and/or a description by category or function.

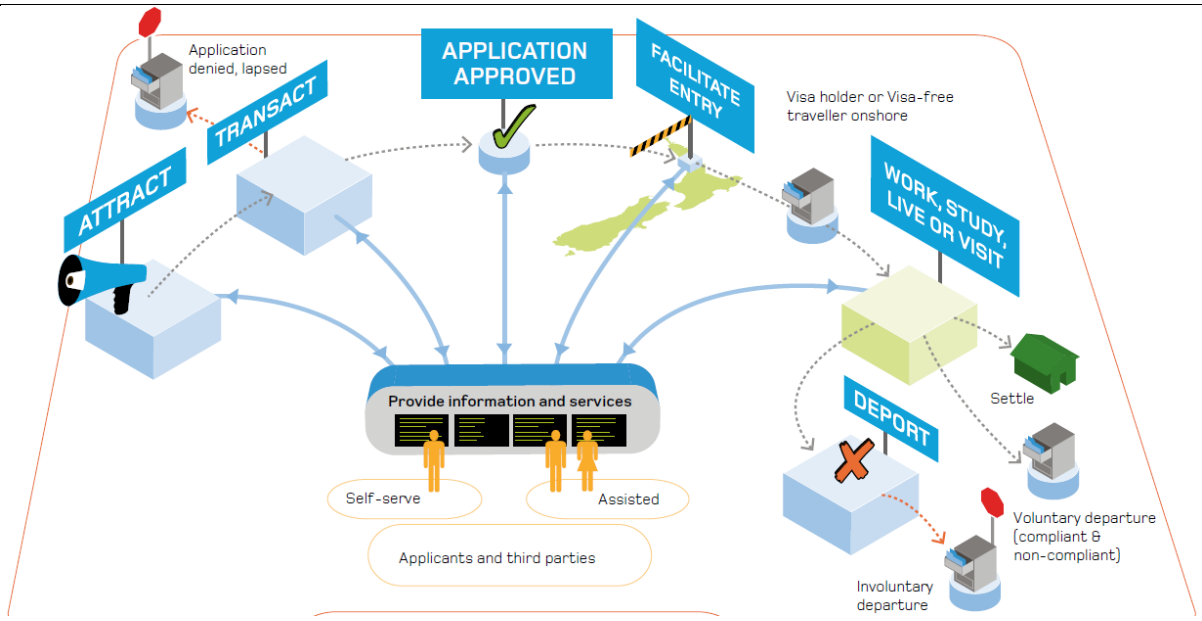
The main area of MBIE that uses operational algorithms that impact on individuals or groups is Immigration New Zealand ("INZ"). INZ aims to manage risk to New Zealand and ensure that travellers pass through our borders and receive immigration decisions quickly consistent with Government policy.

The volume of transactions handled by INZ is large and growing. INZ in 2016/17 made 800,000 immigration decisions, covering over a million people. Over 6,750,000 travellers passed through New Zealand's borders in 2016/17. Data and algorithms assist with risk management and managing this volume of transactions effectively. They allow staff expertise to be targeted to the areas where it is most needed.

Personal information about individuals and algorithms are used to support INZ's operational processes across the customer journey:

Interest → Enquire → Apply → Assess & Decide → Travel → Stay

- **Interest:** Marketing activities to attract the best talent for skill shortages may use external data sources and algorithms to target a campaign.
- **Enquire:** Algorithms are used to tailor the presentation of visa options on the INZ website based on self-reported information like intentions for coming to NZ.
- **Apply:** Online application forms dynamically request information to enable immigration officers to make a visa decision in line with current immigration policy.
- **Assess & Decide:** Internal and external data sources are used to assess applications based on personal characteristics in accordance with the Immigration Act 2009 and immigration instructions. Section 392 of the Immigration Act expressly recognises that "immigration matters inherently involve different treatment on the basis of personal characteristics" and accordingly the jurisdiction of the Human Rights Commissioner and the Human Rights Act is limited.
- **Travel:** Some border checks are performed before people board a plane using travel data and further checks are performed at arrival in NZ, for example to ensure that people are who they say they are and to decide whether entry is permitted.
- **Stay:** Management of compliance with visa conditions relies to various degrees on internal and external data sources.



The broad categories of operational algorithms in use by INZ are:

- biometric and biographic matching
- customer segmentation based on risk
- customer screening based on eligibility/alerts/watchlists/risk eg Interpol alerts
- case prioritisation.

2.2 If possible, please include an example or examples for illustration.
Examples might describe a particular algorithm that reflects a larger number of similar processes, from data collection through to decision making, which focus on decisions that impact individuals or groups. Specific assurances and safeguards should be described, and the scale and scope of application noted.

Examples of algorithms in use by Immigration INZ that impact on decisions about individuals or groups include:

	IDMe (Identity Management system of INZ)
Phase of customer journey	Apply, Assess & Decide, Travel, Stay
Type	Biometric and biographic matching
Description	INZ's identity management system IDMe is used to capture, match and look up identities of customers. Identity matching and resolution decides if a customer is somebody for whom INZ already has an identity created and stored in its system. The matching uses biographic and/or biometric information. Biometric information comprises pictures of faces and/or fingerprints. Biographic information includes dates of birth/marriage, addresses, etc. Around 35% of all cases need assistance by a human being to perform a manual identity resolution. This is a result of conservative thresholds configured in the system to ensure that the system makes a decision by itself only if it is sufficiently confident. Manual resolution can be required for biographic matching as well as biometric matching.
Impact on individual(s)	Decides if somebody can be matched against a known identity or if human assistance is needed to verify identity. Information held in

	relation to a matched identity may be relevant to the visa decision process. Establishing a person's identity is only one step in the visa decision process – the decision about a visa is ultimately taken by an immigration officer.
Value add	Improved ability to perform high quality and consistent identity matching.

	Visa Application Risk Triage
Phase of customer journey	Assess & Decide
Type	Customer segmentation based on risk
Description	Assigns a risk level to visa applicants based on risk rules that use information INZ holds about the applicant. The risk level only determines level of verification required, it has no relationship with decision making. Risk rules are generated by subject matter experts and assessments include both qualitative and quantitative information. Risk rules are approved by a governance group (the Triage Reference Group) based on a report outlining the justification for the rule. A considerable number of the risk rules originate from statistical modelling. The majority of the risk rules generated by modelling identify low risk applicants. Rules generated by modelling are based on past decisions and require a high level of statistical confidence to be operationalised. The rule set is reviewed on a regular basis and must go through an approval process by the Triage Reference Group. Approval is required to change the minimum level of confidence for a rule to be operationalised as well as to change the minimum number of data points that support a rule. INZ is investigating future expansion of the Triage engine to automate low risk approval decisions on visa applications. Immigration officers would continue to assess and decide all applications not being auto-approved under this proposal and sampling of low risk auto approvals would continue under the quality assurance system to monitor performance of the low risk triage rules.
Impact on individual(s)	The amount of verification work to be done by an immigration officer on an individual visa application depends on the risk level assigned to an individual by the triage system. The final decision to grant or decline a visa is made by an immigration officer.
Value add	Risk triage allows for the streamlining of visa processing and focussing of human attention where it is most warranted. This allows for more efficient use of verification resources over high volume visa streams, but all decisions are made by immigration officers based on policy and information available.

	Advance Passenger Processing
Phase of customer journey	Travel

Type	Customer screening based on eligibility / alerts / watchlists / risk
Description	Since 2004, there have been increasing efforts to perform some border checks at the port of embarkation overseas. The system that helps to operationalise these efforts is the Advance Passenger Processing ("APP") system. It collects data submitted by airlines during check-in when customers present their passports. The airlines submit those records to the APP system which performs some validation matching, as well as some automated "border checks" (e.g. does the individual have a valid visa, if one is needed, or matching the individual's passport against a list of lost or stolen passports). The result of those checks is sent back to the airline in real-time in the form of "denied board / contact INZ" or "OK to Board" messages.
Impact on individual(s)	Depending on the outcome of some automated "border checks" a passenger might be denied boarding at the port of embarkation.
Value add	Streamlining of visa offshore border checks in an efficient and consistent manner.

	Passenger Name Records
Phase of customer journey	Travel
Type	Customer screening based on risk
Description	As many foreign nationals travelling to New Zealand are not required to apply for a visa before travelling INZ may have very limited amounts of information about those individuals. To be able to still perform some border checks offshore at the port of embarkation, the Risk Targeting Programme was put in place. This programme uses APP information and Passenger Name Records ("PNR") data. A computer system receives (via the airlines) a list of passengers checked in on a certain plane. This information and PNR attributes (e.g. travel agent, ticket details, itinerary, etc.) are used to enable staff to look manually for abnormalities or patterns that match risk rules created by subject matter experts.
Impact on individual(s)	Depending on the outcome of some border checks (mainly performed by staff) a passenger might be denied boarding at the port of embarkation.
Value add	Streamlining of visa offshore border checks and increased efficiency and consistency.

2.3 Who designed or created the algorithms described in response to 2.1 and 2.2 (internal staff, external providers?)
It may be helpful to indicate where the agency sought legal advice relating to the design and/or procurement of algorithms.

The majority of the algorithms described above were created by internal staff, with assistance from external ICT service providers for underlying infrastructure. For the Visa Application Risk Triage system, risk rules were developed by internal experts and a number of external providers were commissioned to provide advice and assess the methodology and approach (including SAS Business Analytics Advisory Services, PricewaterhouseCoopers, Dragonfly and Knoware). The IDMe system was designed, developed and delivered by Datacom, using technology and biometric know-how from other external technology

providers (DAON, NEC and Intech). These suppliers are also involved in ongoing support and tuning of the system.

2.4 Detail any assurance processes, or related safeguards used in conjunction with algorithms described in response to 2.1.

If the agency has a written policy related to automated decision making or the use of algorithms it may be helpful to cite this along with the role of human intervention and discretion. It may also be helpful to describe the nature of the data sets/ sources that are utilised and any records that are maintained so that the operation of the algorithm can be explained including what information is taken into account for the purposes of making any decisions. Examples of assurance should include data management, oversight, or other governance that support responsible use.

Automated electronic decision making within INZ is governed by the relevant sections of the Immigration Act 2009 (e.g. sections 28-32) and the INZ Operational Manual: http://www.legislation.govt.nz/act/public/2009/0051/latest/versions.aspx). https://www.immigration.govt.nz/opsmanual/#42603.htm).

Governance decision making and assurance for INZ systems are provided by the INZ Operating System Integrity Committee (OSIC). Amongst other things, OSIC oversees IDMe. Triage has its own first level oversight group - the Triage Reference Group – which makes decisions about thresholds, methodologies and risk rules. OSIC acts as a second level governance group for Triage.

Data governance across MBIE is the responsibility of the Enterprise Data and Information Steering Group. Each data asset has an identified data steward, who is responsible for ensuring data is maintained to agreed standards, and for ensuring that privacy, confidentiality, security and legislative requirements are met, preventing misuse of data.

3. Policy Development and Research

This includes analytical tools used to analyse large and varied data sets to identify patterns and trends and to support policy development or to model potential interventions. The key distinction between these and operational algorithms is that they have no direct or significant impact on individuals or groups. They may inform policy development but have no significant impact on service delivery. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes**.**

3.1 Describe how algorithms are used in policy development and research.

Please provide an indication of the scale and scope of algorithm(s) used and the kinds of policy or research that they inform.

MBIE uses capabilities in statistical and data analytics, qualitative and quantitative evaluation skills, social and economic research and modelling and analysis to support policy development and evaluation across a broad range of ministerial portfolios. This includes using analytical tools to analyse large and varied data sets to identify patterns and trends. MBIE is an active user of the integrated data held in Stats NZ's Integrated Data Infrastructure (IDI) and Longitudinal Business Database (LBD) for research on areas such as economic development, productivity, labour market outcomes and housing. MBIE also collects and analyses data to produce trends analysis including production of official statistics on energy, minerals, tourism, labour and housing.

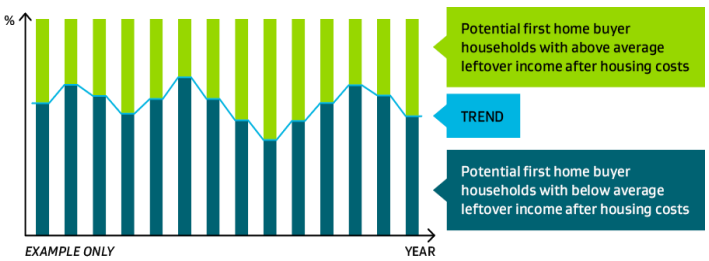
MBIE uses a number of analytical techniques including regression analyses and complex modelling to understand more about market dynamics and how parts of the system interact with each other and/or have different outcomes. However, this analysis for policy development and research is not embedded into algorithmic systems that identify outliers, segment different types of population, or stream line an operational process.

3.2 If possible, please include an example or examples for illustration.

Two examples of MBIE's analytical use of large and varied data sets to identify patterns and trends and to support policy development include:

Jobs Online Vacancy Series
MBIE has developed official statistics on on-line vacancies based on data inputs provided by private companies (specifically SEEK, Trade Me Jobs, Kiwi Health Jobs, and the Education Gazette). Supplied data files are processed using an auto-coder: data is cleaned, combined, duplicates are removed, and vacancies are coded to occupation, skills, industry and region. The results are then aggregated, summed over three months and seasonally adjusted. The output of this process is a series of indices reported online vacancies at a national level, and by combinations of region, industry and occupation. Job vacancies are an indicator of labour demand, and as such, these indices provide valuable information to support policy and operational decision-making. Among other uses, Jobs Online contributes to Immigration New Zealand's annual review of the Essential Skills in Demand list.

Housing Affordability Measure
MBIE has developed new official statistics on housing affordability by using government's integrated administrative data including the tenancy bond data collected by MBIE, tax data from Inland Revenue, and property value data from Corelogic. The Housing Affordability Measure compares the income after housing costs of potential first home buyers in different parts of New Zealand to the national median income after housing costs for all households. The Measure identifies the proportion of potential first home buyers in a particular area whose income after housing costs is above or below the national median. The Housing Affordability Measure for renters compares the income after housing costs of renters in different parts of New Zealand to the national median income after housing costs for all households. The Measures are based on real incomes of real households. The Housing Affordability Measure shows a trend, which supports central and local government to identify and respond to affordability challenges that are specific to each housing market. The indicators and data are published regularly on MBIE's website.



4. Business rules

These are simple algorithms created by people that use rules to constrain or define a business activity to make determinations about individuals or groups, without a significant element of discretion. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes.

4.1 Describe the role of operational business rules used in decision making.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of decisions that they inform.

The main area of MBIE that uses business rules that impact on individuals or groups is Immigration NZ. Simple algorithms are used to assist customers with navigating the immigration system by presenting what visas they can apply for and directing them to submit the right information so that their application is decision-ready. Immigration NZ also uses automated business rules to support granting of interim visas.

4.2 If possible, please include an example or examples for illustration.

Two examples of use of automated business rules include:

	Immigration New Zealand website
Phase of customer journey	Interest & Enquire
Type	Computer implementation of policy based business rules/logic
Description	The INZ website contains a business logic component to display information conditional on self-reported data (e.g. age, intentions for coming to NZ) and current INZ operational policy. Areas of the website driven by such business logic are: - Display of the top nine most relevant and most applicable visa options - Office and fee finder information - Requirements for police certificates - Criteria a candidate needs to fulfil and evidence they need to provide depending on selected visa and provided information like nationality, etc The selection of the top nine most relevant / applicable visa options for each combination of nationality and reasons for coming to NZ (e.g. study, work, visit) are selected based on historical visa application volumes and shown in that that order.
Impact on individual(s)	Might influence the perception of the visa options available to an individual.

Value add	Consistent guidance provided to individuals on the best visa options for them. Improved customer experience by reducing information overload.

	Interim Visas
Phase of customer journey	Assess & Decide, (Stay)
Type	Computer implementation of business rules/logic
Description	Interim visas allow clients to remain in New Zealand lawfully while they have an application being considered by INZ. A computer system is in place to either automatically grant interim visas or refer to an immigration offier according to business rules and operational immigration policy.
Impact on individual(s)	Decides if an individual automatically gets an interim visa (and grants it) or if intervention of a human being is required.
Value add	More efficient and consistent management of the interim visa decision process

5. Utility and Future Use

5.1 Describe any benefits or expected impact generated through the use of algorithms described in the previous sections.
It may be helpful to draw on the specific examples provided previously to explain how the analysis or service delivery in question was conducted prior to the application of algorithms, and related analytical tools, in order to quantify any efficiencies or improvements that have occurred as a result.

The value added by the use of algorithms includes efficiency gains, increased consistency and better use of human capabilities. In operational processes that are handling large and growing volumes, like INZ, use of data and algorithms assists with risk management, managing transactions effectively and targeting human expertise to the areas where it is most needed.

5.2 Describe any challenges or risks your agency is managing as a result of the use of algorithms described in the previous sections, including whether any decisions where algorithms have been used have ever been challenged.
As with 5.1, drawing on specific examples may help illustrate or provide context to this answer. Within this response, it would be useful to provide examples of cases where decisions that involved the use of algorithms were challenged.

MBIE manages privacy risks to individuals and groups through its privacy governance. MBIE's privacy policy requires that whenever a new business activity, process, system is planned, or a change to an existing business activity, process or system is proposed, the new/changed initiative must be assessed to determine if the collection, management, use or sharing of personal information is involved. Associated processes describe how to assess an initiative or change to determine whether personal information will be impacted, and if so, specialised privacy advisors provide guidance on how to manage any associated risks.

Automation can present potential risks of false automated matching or of bias in modelling. INZ manages these risks by using operational algorithms primarily to streamline effort and referring any areas of uncertainty to human decision makers for further analysis. Key systems such as IDMe and Visa Application Risk Triage have specific oversight groups that take decisions about thresholds and methodologies.

INZ Data Modelling Pilot

INZ's approach to data modelling for harm prioritisation was recently challenged in the media. In 2015, INZ's Compliance team began work with the State Services Commission's Continuous Improvement Team to better understand the immigration compliance system and to develop an operating model that put customers (the New Zealand taxpayer) at the front and centre of their work. Out of that three month project, an initial harm prioritisation model was developed through a manual assessment using internal and external data sources.

The pilot was an attempt to use data together with the estimated costs to New Zealand, to identify a group or groups of unlawful migrants who are more likely to commit harm or become victims of harm themselves. These groups were to be prioritised for compliance intervention at the earliest point, before they had a chance to commit, or become victims of, harm. It was intended that this would allow INZ to take a more strategic view of harm in the immigration system and take a better, albeit limited, prioritisation of its compliance response activities.

Only one part of the project was completed. Compliance resources were re-focused to help manage another issue and the project work was not progressed further at that time. Information on risk criteria was gathered by INZ as part its visa application and compliance processes and prioritized by way of a spreadsheet in a testing phase.

5.3 Considering the responses to 5.1 and 5.2 how does your agency assess the ongoing utility of algorithms to its current work?

We are at an early stage in New Zealand and within MBIE in our deployment of this type of technology. We expect its use to grow in order to achieve more effective solutions and deliver benefits for New Zealanders. We see algorithms as delivering high value for the effective delivery of operational functions that process high volumes. MBIE is working actively with the Government Chief Data Steward / Stats NZ, Government Chief Digital Officer / Department of Internal Affairs, the Office of the Privacy Commissioner and our partner agencies to address the challenges and risks presented by emerging technologies. MBIE is leading a cross-government initiative on emerging technologies and regulatory systems

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5.4 Does your agency anticipate that further algorithm development is likely to be important to delivering better outcomes in the future?

MBIE has a focus on growing its enterprise governance, strategy and capability in data and insights, to support three strategic business priorities:

- **Evidence and insights** – to inform development and evaluation of policy and regulatory systems
- **Customer analytics** – to understand our customers' needs holistically and provide enhanced services
- **Operational analytics** – to inform operations and regulation, and enable compliance

MBIE leads the government's digital economy work programme, and supported recent research by the AI Forum on how artificial intelligence will support New Zealand in future. Raising awareness and creating a greater understanding of how algorithms and artificial intelligence will impact future economic growth and drive prosperity for all New Zealanders is an objective of MBIE.

5.5 Does your agency expect to develop operational algorithms that rely on AI (artificial intelligence) or machine learning in the future?

MBIE expects to continue to develop operational algorithms that incorporate AI and machine learning in future in order to deliver value for government and our customers. MBIE has started to explore the potential of artificial intelligence to provide enhanced customer service experiences through the development of chat bots. For example, the Better for Business programme is working with other agencies to pilot a chat bot that would inform businesses that are interested in producing and exporting honey.

INZ is currently in the process of developing operational algorithms relying on machine learning in the Joint Border Analytics (JBA) team. The JBA team was established in late 2016 and consists of staff and contractors from INZ, Customs and the Ministry for Primary Industries. Data modellers, data scientists, data wranglers and business analysts are working together in the JBA team, with input from subject matter experts, to gain new insights into border risk through the use of analytics software and data sharing.

Currently, a number of pilot projects are underway and a work programme for the next 12-18 months with a focus on INZ business problems will be developed shortly. There are not any models or rules developed by the JBA team in operational use at this stage. Processes and controls are in place to ensure that data and analytical techniques are appropriately and safely used by the JBA team.

5.6 Does your agency consider that additional cross-government guidance on the creation and use of algorithms would be helpful?

Yes – MBIE would support additional cross-government guidance on creation and use of algorithms.

5.7 Does your agency consider that it would be useful to be able to seek external, independent, expertise in the creation and use of algorithms?
Yes – MBIE would find it useful to seek external, independent expertise in the creation and use of algorithms.

Ministry of Education

Agency Name	Ministry of Education

1. Data Context

Please provide a high-level overview of how your agency collects, analyses and uses data. This should describe (in general terms) how data supports the work of the agency. This should include information about the types of data that the agency collects and uses (not limited to personal information about individuals). Please indicate whether your agency uses data that is collected and/ or controlled by third parties.

This section should ideally be no longer than three or four paragraphs, written for an audience unfamiliar with the work of your agency.

The Ministry of Education (the Ministry) collects and analyses data about students, teachers and schools. In the main this information is used to help make resource allocation decisions, determine eligibility for various types of funding and support, and to help monitor student achievement and engagement.

Some examples of the types of data collected include:

- school roll returns, which include information about the age, gender, and ethnicity of students
- student engagement, which includes details about discipline such as suspensions and expulsions, transient students, and regular attendance
- board of trustee membership
- early childhood education statistics – such as children's enrolment and attendance and information about staff at the service
- surveys for the Organisation for Economic Co-operation and Development (OECD), such as the programme for international student assessment

While the Ministry collects some types of data itself, it also uses data collected and/or controlled by third parties. Some key examples include: student achievement information collected by NZQA; census datasets held by Statistics New Zealand; and Organisation for Economic Co-operation and Development (OECD) test and survey results that compare New Zealand's performance to other countries.

2. Operational Algorithms

The main focus of this review is operational algorithms which impact significantly on individuals or groups. These automated processes interpret or evaluate information (often using large or complex data sets) that result in, or materially inform, decisions which impact significantly on individuals or groups. They may use personal information about the individuals or groups concerned but do not need to do so exclusively.

Also, any algorithms that may incorporate AI or Machine Learning fall into this definition. Decisions made by people (e.g. frontline staff) that are informed by such algorithms are in scope, as are automated decisions.

This review seeks to compile as complete and thorough an overview as possible of these types of algorithms.

2.1 Describe the role of operational algorithms used in decision making.
As completely and thoroughly as possible, describe operational algorithms used by your agency. This should include of the scale and scope of algorithm(s) used, and how they affect, or influence, operational decisions within your agency. This may include a count or estimate of the number of algorithms employed and/or a description by category or function.

Most of the algorithms currently used by the Ministry are more closely aligned with the business rules category than the operational algorithm category. They are generally used for determining resource allocation, such as staffing levels for a given school, or calculating eligibility for funding. The scale ranges from eligibility calculations that affect a few thousand students (for example assistive technology funding) up to decisions about resource allocation which affect all state schools (for example decile recalculations).

Most of the algorithms used by the Ministry are off the shelf products. For example, Microsoft Excel spreadsheets populated with formulas are used in many cases to calculate eligibility for funding. The Ministry uses Tableau for network school roll modelling, i.e. to determine demand for school buildings based on population projections in given areas. And the Ministry uses SAS for decile recalculation purposes.

We have provided an example below of an operational algorithm that does more than calculate eligibility or resource allocation.

2.2 If possible, please include an example or examples for illustration.
Examples might describe a particular algorithm that reflects a larger number of similar processes, from data collection through to decision making, which focus on decisions that impact individuals or groups. Specific assurances and safeguards should be described, and the scale and scope of application noted.

In June 2016 the Ministry introduced a software programme called the School Transport Route Optimiser to calculate student eligibility for transport assistance and to develop the most efficient routes for school buses.

This algorithm puts school transport policy on a map. To be considered eligible for school transport assistance the students must be attending the closest school they can enrol at, be more than 3.2km (for Primary students) and 4.8km (for Secondary students) from the nearest appropriate school, and there must be no suitable public transport available.

Student locations are geocoded to assist this eligibility calculation using software under license to the Ministry, called IQ Office. The software to determine the most effective route also uses the ‘travelling salesman’ dilemma to determine the shortest distance a bus can travel in order to pick up all the students on a specific route.

As an indication of scale, approximately 72,000 students are eligible for school transport assistance.

2.3 Who designed or created the algorithms described in response to 2.1 and 2.2 (internal staff, external providers?)
It may be helpful to indicate where the agency sought legal advice relating to the design and/or procurement of algorithms.

The School Transport Route Optimisation software was developed by an external provider named Critchlows. A full procurement process was undertaken.

2.4 Detail any assurance processes, or related safeguards used in conjunction with algorithms described in response to 2.1.

If the agency has a written policy related to automated decision making or the use of algorithms it may be helpful to cite this along with the role of human intervention and discretion. It may also be helpful to describe the nature of the data sets/ sources that are utilised and any records that are maintained so that the operation of the algorithm can be explained including what information is taken into account for the purposes of making any decisions. Examples of assurance should include data management, oversight, or other governance that support responsible use.

The Ministry does not currently have a policy relating to automated decision making or the use of algorithms. However, the development of such a policy is on the current work-plan and we intend to align it with work from other agencies such as the Social Investment Agency, MSD and others.

In relation to the School Transport Route Optimiser (STRO) example, the Policy for eligibility relates to Section 139D of the Education Act 1989 and subsequent amendments. The directive and formulaic aspect of the Policy allows ease of using such software and algorithm to be 'put on a map'. However, eligibility decisions may still be overridden at the direction of senior management and generally when special circumstances are taken into account.

The STRO was tested by the Ministry's ICT team to ensure it met needs in terms of delivery and output. It was also subject to a thorough privacy, impact and security risk assessment by an external company.

3. Policy Development and Research

This includes analytical tools used to analyse large and varied data sets to identify patterns and trends and to support policy development or to model potential interventions. The key distinction between these and operational algorithms is that they have no direct or significant impact on individuals or groups. They may inform policy development but have no significant impact on service delivery. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes**.**

3.1 Describe how algorithms are used in policy development and research.

Please provide an indication of the scale and scope of algorithm(s) used and the kinds of policy or research that they inform.

For the purposes of this survey we did not identify any algorithms that fall within this category. The vast majority of algorithms used by the Ministry are more closely aligned with the 'business rules' category. As noted above, the Ministry does use tools such as Tableau for school roll modelling, or SAS for decile funding calculations.

3.2 If possible, please include an example or examples for illustration.

No examples.

4. Business rules

These are simple algorithms created by people that use rules to constrain or define a business activity to make determinations about individuals or groups, without a significant element of discretion. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes.

4.1 Describe the role of operational business rules used in decision making.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of decisions that they inform.

As noted above, the Ministry uses a range of algorithms to calculate resource allocation and eligibility for funding. A range of examples is provided in 4.2 below.

4.2 If possible, please include an example or examples for illustration.

Schools are grouped in deciles (1 to 10). Deciles are used to target some aspects of funding and resources for state and state-integrated schools. Deciles are recalculated every five years, following a census. The Ministry uses standard census data sets such as household income and household crowding, as taken from the Statistics New Zealand Integrated Data Infrastructure (IDI) research database. The Ministry matches student address data with meshblock information and SAS is used to help recalculate deciles.

Equity funding provides additional targeted funding to services that provide early childhood education (ECE) for high-needs families. The Equity Index ratings are calculated in a manner similar to deciles (as above). Child data provided by ECE services is compared against population census information to derive an EQI rating on a scale of 1 to 10.

The Targeted At Risk Grant (TARG) is an operational funding allocation based on an estimate of the number of students on a schools' roll at risk of not achieving NCEA Level 2. The funding is allocated to schools and not individuals. It is based on an estimate of the number of children in each school who were dependents of someone receiving a Ministry of Social Development (MSD) benefit, for a certain number of years. A data match process compares the Ministry's school enrolment data with MSD benefit receipt records to develop estimates of overall need per school. Individuals are not identified.

The Access Boarding Allowance is calculated by assigning values to three elements: distance to nearest appropriate school, distance to nearest school bus or other transport and time taken for total one way journey. Raw scores are put into a database, the total score calculated and applicants above a certain number receive a boarding allowance.

Year 9 Plus is a concept trial, based in the wider Gisborne region, which is intended to help students and families overcome impediments to successful secondary education. The Ministry used a statistical model to predict student's risk of not attaining NCEA Level 2 in order to prioritise the students to be offered the opportunity to enter the programme. For more information you can refer to the national review published on the Education Review Office's website.

Assessments of Early Childhood Education providers are prioritised by using a Microsoft Excel spreadsheet to compare data from different systems to help inform staff decisions about visits. This does not directly affect individuals.

5. Utility and Future Use

5.1 Describe any benefits or expected impact generated through the use of algorithms described in the previous sections.
It may be helpful to draw on the specific examples provided previously to explain how the analysis or service delivery in question was conducted prior to the application of algorithms, and related analytical tools, in order to quantify any efficiencies or improvements that have occurred as a result.

Prior to the School Transport Route Optimisation (STRO) programme, a manual process was employed to determine eligibility and bus routes. This involved plotting student and school location on a map and measuring distances using Google Maps or scale rulers. It previously took between four weeks and two months to develop a single bus route. The STRO programme is able to calculate eligibility and the most efficient bus route in under an hour.

More efficient routes have already reduced the number of kilometres travelled by almost half a million kilometres per year, from a total of around 25 million kilometres.

5.2 Describe any challenges or risks your agency is managing as a result of the use of algorithms described in the previous sections, including whether any decisions where algorithms have been used have ever been challenged.
As with 5.1, drawing on specific examples may help illustrate or provide context to this answer. Within this response, it would be useful to provide examples of cases where decisions that involved the use of algorithms were challenged.

In terms of the STRO, we receive letters from parents from parents of students who have been deemed ineligible for transport assistance. On occasion, special circumstances may merit a direction from Minister to override the rules.

5.3 Considering the responses to 5.1 and 5.2 how does your agency assess the ongoing utility of algorithms to its current work?

The STRO is periodically tested against Google and Bing maps to ensure accuracy. We regularly receive feedback from caregivers and take this into account. Note the STRO was a finalist for three different awards in 2016 including the Geospatial New Zealand Excellence Awards, Geospatial Enablement in the Public Sector, and the PMI Project of the Year. These indicate approval from the New Zealand geospatial community for the programme.
5.4 Does your agency anticipate that further algorithm development is likely to be important to delivering better outcomes in the future?
Given the efficiencies achieved by the STRO we may consider what other areas of the Ministry's work programme might also benefit from algorithm development.
5.5 Does your agency expect to develop operational algorithms that rely on AI (artificial intelligence) or machine learning in the future?
It is too early to answer this question. The Ministry is about to start a project to identify potential areas where cognitive machine based learning could be advanced.
5.6 Does your agency consider that additional cross-government guidance on the creation and use of algorithms would be helpful?
Yes
5.7 Does your agency consider that it would be useful to be able to seek external, independent, expertise in the creation and use of algorithms?
Yes

Ministry of Health

Agency Name	Ministry of Health

1. Data Context

Please provide a high-level overview of how your agency collects, analyses and uses data. This should describe (in general terms) how data supports the work of the agency. This should include information about the types of data that the agency collects and uses (not limited to personal information about individuals). Please indicate whether your agency uses data that is collected and/ or controlled by third parties.

This section should ideally be no longer than three or four paragraphs, written for an audience unfamiliar with the work of your agency.

Data collection

The health sector generates enormous quantities of health data through the record keeping associated with providing health services and treatments. Only a small proportion of this is provided by health sector organisations to the Ministry of Health, but this still results in the Ministry of Health maintaining large databases of selected event level health records about individuals and acquiring other summary level information about the operation of health services.

The Ministry has more than a dozen core data bases called the National Collections which hold hospital records, records of outpatient events and emergency department events, records of elective surgeries, patient flow through secondary services, records of secondary mental health events, deaths and their causes, cancer registrations, community pharmaceuticals dispensed, laboratory tests, enrolment with primary care organisations, maternity care and birth events and immunisation events. The Ministry also maintains national systems for identity (of health consumers and clinicians) and for medical warnings. The Ministry runs national screening programmes that each have datasets associated with them. Various other national health programme have a data component with the Ministry receiving the data.

Data use

The Ministry uses data it collects for a variety of purposes. Data from the health system is used for policy development, performance monitoring, monitoring of service quality and coverage, production and publication of statistics and as an input for health research. Data is shared extensively throughout the health sector to enable sector organisations to derive benefits from nationally consistent data collection. Data is shared with other parts of government where health service provision or outcomes are relevant to the work of government departments. The Ministry publishes data analyses, monitoring reports and open data routinely for sector organisations and others to consume.

Third party data

The Ministry is a significant consumer of population data from Stats New Zealand as an input into funding models and for the calculation, monitoring and publication of disease rates. The Ministry provides health data to the Integrated Data Infrastructure at Stats NZ and has a project in the IDI for data analyses that relate to health policy development.

2. Operational Algorithms

The main focus of this review is operational algorithms which impact significantly on individuals or groups. These automated processes interpret or evaluate information (often using large or complex data sets) that result in, or materially inform, decisions which impact significantly on individuals or groups. They may use personal information about the individuals or groups concerned but do not need to do so exclusively.

Also, any algorithms that may incorporate AI or Machine Learning fall into this definition. Decisions made by people (e.g. frontline staff) that are informed by such algorithms are in scope, as are automated decisions.

This review seeks to compile as complete and thorough an overview as possible of these types of algorithms.

2.1 Describe the role of operational algorithms used in decision making.

As completely and thoroughly as possible, describe operational algorithms used by your agency. This should include of the scale and scope of algorithm(s) used, and how they affect, or influence, operational decisions within your agency. This may include a count or estimate of the number of algorithms employed and/or a description by category or function.

Examples of health system algorithm use

Below are two examples of where operational algorithms are used in the health sector.

InterRAI

interRAI assessment instruments are used to assess the physical and social support needs of (primarily in New Zealand) older people. An interRAI assessment is required by the Ministry of Health prior to a person accessing publically funded home and community support services including entry into aged residential care. Assessors complete the assessments using clinical and other information available, including direct conversation with the older person. The items in each assessment instrument are recorded in a standardised way that translate into data elements.

There are four types of algorithms embedded within each interRAI instrument:

1. Clinical Assessment Protocols (CAPs)
2. Outcome Scales
3. Case-Mix Classification
4. Quality Indicators (QIs)

Clinical Assessment Protocols (CAPs) are designed to assist the assessor to interpret systematically all the information recorded on an instrument as decision support to inform a client's care plan.

Outcome Scales are used to evaluate an individual's current clinical status. When longitudinal data is collected, changes in clinical status over time can also be evaluated and compared.

Case-Mix Classification groups individuals into categories reflecting the relative costs of services and supports they are likely to use. These tools are designed to address the challenge faced by funders and providers the world over: how to allocate limited resources in a fair and equitable way.

Quality Indicators (QIs) are regarded as pointers to the quality of care in service provision. They may be used to measure changes in service quality, either to indicate potential problem areas that need further review and investigation and/or to measures outcomes of quality improvement initiatives. QIs use data elements to establish a measure that can be

translated into a statistical summary. These summary measures reflect presumed quality of care.

CPAC – elective surgery prioritisation
Clinical Prioritisation (Access Criteria) are a suite of tools that are designed to rank individual patients based on clinically developed criteria (and categories) with appropriately weighted points attached. The outcome is a score between 0 and 100 from addition of the assigned points values. Tools are available for General Surgery, Bariatric Surgery, Excision of skin lesions, ORL Surgery, Gynaecology, Assisted Reproductive Technology, Cataract Surgery, Orthopaedic Surgery, Plastic Surgery, Cardiac Surgery (Urgency). Tools for Paediatric Orthopaedic Surgery and Urology are being tested. The active tools are hosted by a web service allowing for integration with the clinical workstation software from DHBs (variable).

It is a requirement (from the Crown Funding Agreement down) that all patients accessing elective services within the publically funded health system are prioritised on the appropriate, nationally recognised, prioritisation tool. The principal purpose of this is management of capacity by admitting the right number of patients to the waiting list based on historic throughput (and accounting for service growth) in order to facilitate the treatment of all patients with in the 4 months elective delivery target.

2.2 If possible, please include an example or examples for illustration.
Examples might describe a particular algorithm that reflects a larger number of similar processes, from data collection through to decision making, which focus on decisions that impact individuals or groups. Specific assurances and safeguards should be described, and the scale and scope of application noted.

CPAC – elective surgery prioritisation
An example of these would be the General Surgery Prioritisation Tool.
The IOL is the result of an Impact on Life Questionnaire filled in by the patient

Impact on Life	**Weighting**
6	0
36	17.5
Episode duration	
Nil	0
Minutes	7.1
Hours	8.6
Days	9.8
Constant	11.2
Frequency	
Nil	0
Less than monthly	7.1
Monthly	8.3
Weekly	9.4
Daily	10
Constant	12

Overall duration on IoL	
No significant impact	0
< 1 year	0.8
> = 1 year	1.4
Likelihood of risk of deterioration	
Low	0
Medium	1.9
High	11.1
Significance of risk of deterioration	
Low	0
Medium	2.2
High	12.1
Degree of benefit	
Small	0
Moderate	9.1
Large	17.4
Likelihood of maximum benefit	
Low	0
Medium	16
High	17.4

2.3 Who designed or created the algorithms described in response to 2.1 and 2.2 (internal staff, external providers?)
It may be helpful to indicate where the agency sought legal advice relating to the design and/or procurement of algorithms.

InterRAI
Both interRAI assessment instruments and algorithmic measures are the intellectual property of interRAI international. Use in New Zealand is through a royalty free agreement with the Director General of Health.

CPAC – elective surgery prioritisation
Clinical Prioritisation tools have been iteratively developed by clinical working groups with support and leadership from the Ministry of Health since the late 1990s. Over the last 10 years improvements in the way we understand the decision making processes used by clinicians has encouraged moving away from condition based criteria to much more generic and 'holistic' criteria such as patient need (patient derived from IOL Questionnaire) Likelihood and Consequence of deterioration, Likelihood and extent of benefit, Relative risk (co morbidities etc.), Window of opportunity etc. The relative weighting of the criteria and categories offer each specialty to put their 'stamp' on the tool. The process of weighting is facilitated using the 1000Minds decision support software. In the early phase of the development of the 'modern suite of tools' both a high level expert reference panel and the inclusion of an ethicist in the working groups offered opportunity to reflect on the social relevance, equity impact, legal and ethical 'fish hooks' that explicit prioritisation for access to surgery in a resource constrained health care environment exposed.

2.4 Detail any assurance processes, or related safeguards used in conjunction with algorithms described in response to 2.1.

If the agency has a written policy related to automated decision making or the use of algorithms it may be helpful to cite this along with the role of human intervention and discretion. It may also be helpful to describe the nature of the data sets/ sources that are utilised and any records that are maintained so that the operation of the algorithm can be explained including what information is taken into account for the purposes of making any decisions. Examples of assurance should include data management, oversight, or other governance that support responsible use.

InterRAI

interRAI is an international collaborative to improve the quality of life of vulnerable persons through a seamless comprehensive assessment system. The scales, algorithms and case-mix measures are have been developed by a group of international experts and validated through substantial empirical research, implementation studies and clinical focus groups.

CPAC – elective surgery prioritisation

All users of the web service are registered and assigned appropriate clinical, director or management roles with increasing access to records of users under them, for example a clinician can see his records and a report comparing his/her results to an aggregation of other clinicians with in his/her DHB and service. A Clinical Director can see all the departments records and reports compared with aggregated national data. Documentation of Clinician's roles, Clinical director's role and associated clinical director reports and also delegation levels are all available.

3. Policy Development and Research

This includes analytical tools used to analyse large and varied data sets to identify patterns and trends and to support policy development or to model potential interventions. The key distinction between these and operational algorithms is that they have no direct or significant impact on individuals or groups. They may inform policy development but have no significant impact on service delivery. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes**.**

3.1 Describe how algorithms are used in policy development and research.

Please provide an indication of the scale and scope of algorithm(s) used and the kinds of policy or research that they inform.

The Ministry uses some algorithms and advanced analytics (micro simulation modelling) in policy development and research – below are a couple of examples. The use of these techniques is likely to increase in the future as the Ministry works to lift its analytical maturity.

Virtual Diabetes Register

Uses indications of diabetes from various national datasets (hospitalisations, outpatient appointments, pharmaceuticals dispensed, laboratory tests, deaths) to estimate the prevalence of diabetes in NZ. Results are used for policy formation and as an input for other pieces of research and analysis. Further detail can be found at the link below: https://www.health.govt.nz/our-work/diseases-and-conditions/diabetes/about-diabetes/virtual-diabetes-register-vdr

Simulation model for population health outcomes

Base-line data about health states of New Zealanders is used along with their probability of developing disease (diabetes or CAD) into the future, based on demographics (sex, age,

gender, ethnicity, deprivation) and comorbidities (as measured by a composite comorbidities index, created from pharmaceuticals data). The purpose is to project the probable pattern of long term conditions into the future, to assess burden of disease and cost.

3.2 If possible, please include an example or examples for illustration.

4. Business rules

These are simple algorithms created by people that use rules to constrain or define a business activity to make determinations about individuals or groups, without a significant element of discretion. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes.

4.1 Describe the role of operational business rules used in decision making.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of decisions that they inform.

4.2 If possible, please include an example or examples for illustration.

5. Utility and Future Use

5.1 Describe any benefits or expected impact generated through the use of algorithms described in the previous sections.
It may be helpful to draw on the specific examples provided previously to explain how the analysis or service delivery in question was conducted prior to the application of algorithms, and related analytical tools, in order to quantify any efficiencies or improvements that have occurred as a result.

Both interRAI and CPAC are intended to improve the consistency and equality of clinical decisions to treat and provide additional services.

5.2 Describe any challenges or risks your agency is managing as a result of the use of algorithms described in the previous sections, including whether any decisions where algorithms have been used have ever been challenged.
As with 5.1, drawing on specific examples may help illustrate or provide context to this answer. Within this response, it would be useful to provide examples of cases where decisions that involved the use of algorithms were challenged.

5.3 Considering the responses to 5.1 and 5.2 how does your agency assess the ongoing utility of algorithms to its current work?

5.4 Does your agency anticipate that further algorithm development is likely to be important to delivering better outcomes in the future?

Yes, there is likely to be more use of algorithms, AI and decision-support tools rather than less in the future. This makes it imperative that we better understand the strengths, weaknesses, blind spots and embedded biases of these tools to ensure they are both fit-for-purpose and creating optimal outcomes. One avenue the Ministry is using to develop understanding of these issues in the health sector is running a one day workshop on “Safer and more effective use of algorithms in the health sector” on 28 August. The morning will be speakers providing background and context. The afternoon will be spent developing a NZ health sector framework for governance, assurance/confidence, managing bias and operationalizing algorithms.

5.5 Does your agency expect to develop operational algorithms that rely on AI (artificial intelligence) or machine learning in the future?

Very likely.

5.6 Does your agency consider that additional cross-government guidance on the creation and use of algorithms would be helpful?
Collation and packaging of existing work done by agencies such as MSD, SIA, DFP and Stats would be helpful – perhaps bringing all relevant material together on an existing web hub.
5.7 Does your agency consider that it would be useful to be able to seek external, independent, expertise in the creation and use of algorithms?
Possibly depending on the use case.

Ministry of Justice

Agency Name	Ministry of Justice

1. Data Context

Please provide a high-level overview of how your agency collects, analyses and uses data. This should describe (in general terms) how data supports the work of the agency. This should include information about the types of data that the agency collects and uses (not limited to personal information about individuals). Please indicate whether your agency uses data that is collected and/ or controlled by third parties.

This section should ideally be no longer than three or four paragraphs, written for an audience unfamiliar with the work of your agency.

The purpose of the Ministry of Justice is to deliver people-centred services that provides access to justice for all.

The Ministry of Justice primarily collects administrative data to support the efficient delivery of justice services. This data is analysed and used to support operational efficiency, measure operational and system performance, inform improvement opportunities, and support policy development and interventions.

Key datasets owned and collected by the Ministry include data about legal aid, the public defence service, fines collection, contact centre transactions, and finance.

Court information about individual cases remains under the control of the Court (i.e. the Judiciary), however anonymised and aggregated information from individual cases is used by the Ministry to support policy formation, statistics and research.

Other third party data accessed and used includes data from NZ Police (about victimisations and Police proceedings), the Department of Corrections (on people under Corrections management), provider community services (such as community law centres), and data from Netsafe about harmful digital communications.

2. Operational Algorithms

The main focus of this review is operational algorithms which impact significantly on individuals or groups. These automated processes interpret or evaluate information (often using large or complex data sets) that result in, or materially inform, decisions which impact significantly on individuals or groups. They may use personal information about the individuals or groups concerned but do not need to do so exclusively.

Also, any algorithms that may incorporate AI or Machine Learning fall into this definition. Decisions made by people (e.g. frontline staff) that are informed by such algorithms are in scope, as are automated decisions.

This review seeks to compile as complete and thorough an overview as possible of these types of algorithms.

2.1 Describe the role of operational algorithms used in decision making.

As completely and thoroughly as possible, describe operational algorithms used by your agency. This should include of the scale and scope of algorithm(s) used, and how they affect, or influence, operational decisions within your agency. This may include a count or estimate of the number of algorithms employed and/or a description by category or function.

Three ‘operational algorithms’ are currently in use to support frontline staff to make decisions about the collection of fines and reparation. While these operational algorithms recommend actions, all final decisions about actions and interventions are made at the discretion of a Collections Registry Officer.

2.2 If possible, please include an example or examples for illustration.
Examples might describe a particular algorithm that reflects a larger number of similar processes, from data collection through to decision making, which focus on decisions that impact individuals or groups. Specific assurances and safeguards should be described, and the scale and scope of application noted.

Case study 1: Segmentation

Segmentation rules have been developed that categorise customers into one of three segments, based on how likely they are to their pay fines. These segments broadly have the following customer characteristics:

- Segment 1 – they are likely to pay
- Segment 2 – they are unlikely to want to pay, but are able to
- Segment 3 – they do not have the finances to pay or they cannot be located.

This segmentation is based on customers’ past events such as their fines history and previous breaches of arrangements. All collection cases go through this segmentation process (around 500,000 per year), and this process has been active since 2007.

Segmentation information is provided to deputy registrars to help them make efficient and consistent decisions about actions to resolve a customer’s fines – the segmentation recommends relevant interventions, but it does not replace a deputy registrar’s discretion to make whatever decision they think is best.

The use of segmentation helps to move away from a one-size-fits all approach to resolving fines, by tailoring more appropriate interventions to different customer segments. This means we’re more likely to get a positive response to interventions applied, collecting more fines and reparation and reducing effort required by Ministry staff.

Case study 2: Work Manager

The ‘work manager’ is a series of systems that capture, prioritise and distribute work for collections registry officers to action. Actions might include following up breached arrangements, or reviewing a payment arrangement. Work tasks are prioritised using a points system based on information about the case such as the type and value of penalty, availability of information about a customer (e.g. address or employer), and Ministry priorities (e.g. reparation would be prioritised above other collections activity).

Around 1.1 million active tasks are included in the work manager system at any point in time, and this system has been active since 2011. Not all cases will be assigned enough points to be assigned to a staff member to action via work manager, however other approaches are in place to target these cases such as reminder letter campaigns.

The ‘work manager’ systems support optimal utilisation and efficiency of limited Ministry resources. Tasks that are more likely to get a positive return are prioritised, enabling the Ministry to collect more fines and reparation and reduce time and effort spent by Ministry staff on cases unlikely to give a positive return.

Case study 3: Attachment orders

An attachment orders instructs an employer or Work and Income to transfer money from the debtor's wages or social benefit to the Ministry. A list of cases eligible for Attachment Orders is automatically generated each day based on eligibility criteria using case information and customer history, and this process has been active since 2016.

This list is considered by a collections Registry Officer who uses their discretion to decide whether to issue an attachment order. Staff are instructed to undertake an in-depth check of a minimum percentage of the profiles as a quality assurance process. Around 40,000 attachment orders are issued by this process each year.

The Courts Matters Bill has a second reading in the House in July 2018. This bill allows for automated electronic systems to add fines to existing arrangements, and issue attachment orders or deduction notices - without the need for a Collections Registry Officer to make the decision.

The bill requires that a safeguard process must be available for an affected customer to ask for review of a decision. The bill gives permission for the Ministry to use automated electronic systems, but their use is not mandatory and the legislative process provides for transparency and public scrutiny.

The automation of attachment order candidates means that candidates meeting eligibility criteria are identified quickly and efficiently – freeing up limited Ministry resources to focus on more complex cases.

2.3 Who designed or created the algorithms described in response to 2.1 and 2.2 (internal staff, external providers?)
It may be helpful to indicate where the agency sought legal advice relating to the design and/or procurement of algorithms.

The operational algorithms described above were all developed by internal staff, with some support from specialist contractors. Legal advice was sought to confirm legislative requirements were met.

2.4 Detail any assurance processes, or related safeguards used in conjunction with algorithms described in response to 2.1.
If the agency has a written policy related to automated decision making or the use of algorithms it may be helpful to cite this along with the role of human intervention and discretion. It may also be helpful to describe the nature of the data sets/ sources that are utilised and any records that are maintained so that the operation of the algorithm can be explained including what information is taken into account for the purposes of making any decisions. Examples of assurance should include data management, oversight, or other governance that support responsible use.

Specific safeguards in place for existing operational algorithms are described in section 2.2. There is full human intervention and discretion for all decisions made.

A draft Ministry data and information policy (currently going through governance sign-off) applies information principles to the management and use of data and information for which the Ministry has accountability. This draft policy states Ministry intent to apply the six principles for the safe and effective use of data and analytics, recently released by the Privacy Commissioner and the Government Chief Data Steward. These principles apply to algorithmic decision-making.

No dedicated governance of existing operational algorithms is in place, however new algorithm development would be overseen by the Ministry's senior executive data governance group.

3. Policy Development and Research

This includes analytical tools used to analyse large and varied data sets to identify patterns and trends and to support policy development or to model potential interventions. The key distinction between these and operational algorithms is that they have no direct or significant impact on individuals or groups. They may inform policy development but have no significant impact on service delivery. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes**.**

3.1 Describe how algorithms are used in policy development and research.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of policy or research that they inform.

A wide range of analytical tools and approaches are used in the Ministry to analyse large and varied data sets to support policy development or to model potential interventions. This includes descriptive statistics, analysis of surveys, resource modelling, modelling impacts of potential policy changes based on assumptions, projections and scheduling.

3.2 If possible, please include an example or examples for illustration.

Examples of analysis to inform policy:

- A micro-simulation model built using the Integrated Data Infrastructure (IDI) to identify different cohorts of the population. This model predicts how many times cohorts of people are likely to commit an offence or be victimised. This helps us understand which groups of people crime reduction interventions should target. This helps inform policy decisions as well as justice budget bids.
- Modelling the expected impact to volumes and costs of the family justice system, based on assumptions driven by proposed changes to policy settings.
- Broad analysis using the IDI to determine risk and protective factors for family and sexual violence, and to model impacts of different interventions to support national strategy development.
- Modelling to predict amounts of resource required based on national workload projections, and where these resources should be allocated. For example, front-line District Court resourcing and Public Defence Service resource modelling.

4. Business rules

These are simple algorithms created by people that use rules to constrain or define a business activity to make determinations about individuals or groups, without a significant element of discretion. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes.

4.1 Describe the role of operational business rules used in decision making.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of decisions that they inform.

Non-automated business rules inform some operational processes such as identifying fixated persons of interest (for security risk) and granting of Legal Aid.

4.2 If possible, please include an example or examples for illustration.

Persons of interest that may pose a security risk to Ministry staff are identified from a range of intelligence sources such as information from Courts and Official Correspondence. Business rules are applied by a security officer to determine which persons of interest would meet the threshold for a 'fixated person of interest', and additional security measures are applied for these people.

Legal Aid granting decisions are based on a clearly documented process and eligibility rules to determine if the applicant and proceeding are eligible for Legal Aid. There is no significant element of discretion applied.

While Legal Aid granting decisions are currently made manually and informed by business rules, the Legal Services Act 2011 does allow the use of automated electronic systems for certain grants. However, there are currently no plans to develop such automated systems.

5. Utility and Future Use

5.1 Describe any benefits or expected impact generated through the use of algorithms described in the previous sections.
It may be helpful to draw on the specific examples provided previously to explain how the analysis or service delivery in question was conducted prior to the application of algorithms, and related analytical tools, in order to quantify any efficiencies or improvements that have occurred as a result.

The main benefits of operational algorithms currently in use are to:

- Support customer outcomes by improving timeliness of decision making, consistency of decisions, and tailoring more appropriate interventions to different customer segments
- Support improved utilisation and efficiency of limited Ministry resources

The combination of automated algorithm use with final human authority on decision making is felt to provide the best balance of achieving efficiency benefits while still maintaining final decision making control by subject matter experts. Without these algorithms, significant additional resources would be required to maintain current levels of fines and reparation collection.

The benefits of analytical tools that support policy/interventions are wide ranging, and align with our Ministry purpose to deliver people-centred services to provide access to justice for all.

5.2 Describe any challenges or risks your agency is managing as a result of the use of algorithms described in the previous sections, including whether any decisions where algorithms have been used have ever been challenged.
As with 5.1, drawing on specific examples may help illustrate or provide context to this answer. Within this response, it would be useful to provide examples of cases where decisions that involved the use of algorithms were challenged.

The use of the operational algorithms described above is considered to be low risk, as the final decisions are made by humans and decision review processes are in place should customers want to challenge decisions.

Specific challenges for attachment orders:

- Information applied to attachment orders can be out of date. Where this occurs either employers contact the Ministry to advise the customer is no longer employed or the Collections Registry Officer makes contact with the employer if no payments are received.
- Processes are in place to ensure affordability for customers, including a review process if the customer contacts the Ministry and assessment of protected earning rates (including beneficiaries).

Outcomes achieved from applying operational algorithms are monitored regularly, and continuous improvement activities are undertaken as required.

5.3 Considering the responses to 5.1 and 5.2 how does your agency assess the ongoing utility of algorithms to its current work?

The ongoing use of algorithms within the Ministry is felt to be beneficial, where appropriate assurances and safeguards are in place. The Ministry is committed to the principles for the safe and effective use of data and analytics.

5.4 Does your agency anticipate that further algorithm development is likely to be important to delivering better outcomes in the future?

A key Ministry goal is to use data insights to deliver better services. Our focus in 2018/19 is to embed business intelligence, information management and good data and information practices across the Ministry.

A small amount of work is planned to occur this financial year to test the feasibility of automating processes and decisions. The focus of this will be to test if there is value and feasibility including assessment against adopted principles, as well as maintaining a watching brief on the outcomes of this review and the data permissions environment. The legislative changes described above are important to enable further algorithm use.

5.5 Does your agency expect to develop operational algorithms that rely on AI (artificial intelligence) or machine learning in the future?
No artificial intelligence or machine learning is planned or being investigated currently.
5.6 Does your agency consider that additional cross-government guidance on the creation and use of algorithms would be helpful?
The principles for the safe and effective use of data and analytics developed by DIA have been helpful to inform Ministry policy. The Ministry of Justice welcomes any additional cross-government guidance that would support the appropriate development and use of algorithms to enable delivery of benefits to New Zealand.
5.7 Does your agency consider that it would be useful to be able to seek external, independent, expertise in the creation and use of algorithms?
External independent expertise is not felt to be needed at this stage, given our minimal use of algorithms.

Ministry of Social Development

Agency Name	Ministry of Social Development

1. Data Context

Please provide a high-level overview of how your agency collects, analyses and uses data. This should describe (in general terms) how data supports the work of the agency. This should include information about the types of data that the agency collects and uses (not limited to personal information about individuals). Please indicate whether your agency uses data that is collected and/ or controlled by third parties.

This section should ideally be no longer than three or four paragraphs, written for an audience unfamiliar with the work of your agency.

Collecting client information

We collect client personal information so that we can provide income support, and connect clients with employment, education, and housing services. To help us do this, we collect information relating to client identity, client relevant history, and client eligibility for our services.

We receive this information directly from clients when they apply for or receive a service from us, and we sometimes collect information about clients from other parties, including other government agencies. We sometimes transform the data we collect to create new data.

Using client information

We use information about our clients to make decisions. Some of these decisions are about individual clients – whether they are eligible for our services and how we can best help them. Some are about running our operations and ensuring our services are effective. And others are for the future – what systems and processes we need, and what services we will provide.

All of the decisions we make aim to help our clients be safe, strong, and independent, and ensure we are using your information efficiently and ethically.

2. Operational Algorithms

The main focus of this review is operational algorithms which impact significantly on individuals or groups. These automated processes interpret or evaluate information (often using large or complex data sets) that result in, or materially inform, decisions which impact significantly on individuals or groups. They may use personal information about the individuals or groups concerned but do not need to do so exclusively.

Also, any algorithms that may incorporate AI or Machine Learning fall into this definition. Decisions made by people (e.g. frontline staff) that are informed by such algorithms are in scope, as are automated decisions.

This review seeks to compile as complete and thorough an overview as possible of these types of algorithms.

2.1 Describe the role of operational algorithms used in decision making.

As completely and thoroughly as possible, describe operational algorithms used by your agency. This should include of the scale and scope of algorithm(s) used, and how they affect, or influence, operational decisions within your agency. This may include a count or estimate of the number of algorithms employed and/or a description by category or function.

MSD uses operational algorithms based on machine learning to inform decisions about which services best meet our clients' needs in the following two areas:

- Identifying clients that may benefit from more active case management.
- Identifying school leavers that may require additional support to get into education, employment or training.

2.2 If possible, please include an example or examples for illustration.

Examples might describe a particular algorithm that reflects a larger number of similar processes, from data collection through to decision making, which focus on decisions that impact individuals or groups. Specific assurances and safeguards should be described, and the scale and scope of application noted.

Client Service Matching (CSM):

Our case managers provide clients with financial assistance and advice in times of hardship, and support them to find a new job. All clients are entitled to our on-demand general case management service and they have equal access to financial support. However, we know that people respond to help in different ways. Some of our clients may need a more active case management service to help them get back to being independent. Active case management makes sure our case managers are more available to clients who need it. Case managers for active services are more proactive — they will contact the client directly, even if the client hasn't asked for help. Because our case management resources are limited, we've developed a method using two statistical models to match clients with case management services that are most likely to work best for them.

The attached document outlines how we use these models, what safeguards we have in place and what the alternative approaches would be.

Youth Service for young people Not in Education, Employment or Training (NEET):

NEET is a service within the Youth Service portfolio and is designed to identify young people who are missing out on basic education and training opportunities, and to proactively offer them support. It's about stepping in early to help build potential through education, training or work-based learning. Young people, who are not in employment, education or training, or at risk of becoming NEET, are offered intensive community-based wraparound services, to support improved qualifications and training opportunities. Established in 2012, the service uses a statistical predictive modelling tool to help identify those school leavers who may be at greater risk of long-term unemployment. The model looks at what we know about a young person, and includes things like how old they are and where they live, as well as things like whether their parents are on a benefit, if they've ever been involved with Oranga Tamariki and their school histories. We know from the experience of other young people that each of these things could be predictor that a young person may need support.

The attached document outlines how we use this model, what safeguards we have in place and what the alternative approaches would be.

2.3 Who designed or created the algorithms described in response to 2.1 and 2.2 (internal staff, external providers?)

It may be helpful to indicate where the agency sought legal advice relating to the design and/or procurement of algorithms.

MSD's operational models were designed and implemented by internal staff.

2.4 Detail any assurance processes, or related safeguards used in conjunction with algorithms described in response to 2.1.

If the agency has a written policy related to automated decision making or the use of algorithms it may be helpful to cite this along with the role of human intervention and discretion. It may also be helpful to describe the nature of the data sets/ sources that are utilised and any records that are maintained so that the operation of the algorithm can be explained including what information is taken into account for the purposes of making any decisions. Examples of assurance should include data management, oversight, or other governance that support responsible use.

The assurance processes applied to existing operational algorithms:

- Privacy Impact Assessment
- Human Rights Assessment
- Ethical Review
- Technical Quality Assurance
- Technical model review by internal experts, for example Actuarial Services, and now advice from the Chief Economist.
- Oversight of data access and use including: usage reports and managerial approval for data access and use.
- Publication of materials that outline where we use operational algorithms, explain how they are involved in decisions and outline the role of human judgment in the processes within which they operate.

Additional assurance to be applied to future operational algorithms:

- Independent technical model review (will be retrospectively undertaken for CSM and NEET)
- Privacy, Human Rights and Ethics framework. This has inbuilt requirements to ensure people have thought about appropriate treatment of privacy, human rights and ethical risks and for transparency, human oversight. Refer attached A3.
- Data protection and use policy: Will cover specific requirements for use of operational algorithms and automated decision making including the role of human judgment.

3. Policy Development and Research

This includes analytical tools used to analyse large and varied data sets to identify patterns and trends and to support policy development or to model potential interventions. The key distinction between these and operational algorithms is that they have no direct or significant impact on individuals or groups. They may inform policy development but have no significant impact on service delivery. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes**.**

3.1 Describe how algorithms are used in policy development and research.

Please provide an indication of the scale and scope of algorithm(s) used and the kinds of policy or research that they inform.

We use algorithms in non-operational areas to inform the design of policy, services, programmes or processes or to evaluate the effectiveness of existing policy, services,

programmes or processes. In these areas the algorithm output is not about an individual or used to make decisions about individuals.

This includes:

- Design and evaluation of trials
- Determining the effectiveness of employment assistance interventions for evaluation reports that are shared with policy and contracting teams
- Providing cost and effectiveness information of programmes for supporting budget bids
- Estimates the impact of proposed changes to benefits
- Modelling the future demand and supply of services

3.2 If possible, please include an example or examples for illustration.

- A cost allocation model that uses administrative data at the individual-event level and staff actions to estimate service provision costs.
- A micro-simulation model that uses administrative data to inform development of initiatives such as the Families Package.
- A social outcomes model, previously known as the actuarial valuation, uses administrative data to understand future demand and supply of services and conduct effective service planning to respond to clients' needs.

4. Business rules

These are simple algorithms created by people that use rules to constrain or define a business activity to make determinations about individuals or groups, without a significant element of discretion. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes.

4.1 Describe the role of operational business rules used in decision making.

Please provide an indication of the scale and scope of algorithm(s) used and the kinds of decisions that they inform.

A large proportion of our operational decisions are driven by business rules. While there are many areas where discretion can be applied some decisions are driven by rules set out in legislation, regulations, welfare programmes or operational policy. As a result many business rules are built into our core client management systems so that case managers do not need to manually determine whether the rules are met on an individual basis.

Case managers can often apply discretion if they think there are other circumstances that should be taken into account that aren't covered by the business rules. While discretion is permitted in many areas there are some areas where the rules are legislated and case managers are not able to go outside the rules. For example if you earn over a certain amount you are not eligible to receive a benefit; this is an area where case managers cannot apply discretion.

4.2 If possible, please include an example or examples for illustration.

- Calculation of rate of benefit: When a client applies for a main benefit the system calculates their rates of benefit based on the information that is entered into the system (e.g. accommodation costs, income, number of children, partner etc.).

- Hardship application: Case managers ask clients a series of questions, the answers to which are entered into the hardship application in our core system. Our case management system then indicates to the case manager whether the rules have been met and whether recommends whether the payment should be granted or not. If the system does not recommend granting the case manager can override and grant the payment if they feel there are other circumstances that mean the payment should be made.
- Processing of medical certificates: When we receive medical certificates that have been electronically lodged by doctors, they are automatically processed if certain business rules are met, to ensure benefit payments are continuous. Where it is not obvious that the details on the medical certificate would meet the business rules for automatic continuation of benefit, it is referred to a centralised unit for triage and then referred to a case manager to discuss with the client if necessary.

5. Utility and Future Use

5.1 Describe any benefits or expected impact generated through the use of algorithms described in the previous sections.

It may be helpful to draw on the specific examples provided previously to explain how the analysis or service delivery in question was conducted prior to the application of algorithms, and related analytical tools, in order to quantify any efficiencies or improvements that have occurred as a result.

Youth Service for young people Not in Education, Employment or Training (NEET):

The Ministry has elected to use predictive modelling in this case because it is the most effective way of identifying young people at risk, given the volume of school leavers each year. Without the model, the information relating to all school leavers would have to be manually reviewed, which is not feasible given the volume of school leavers each year. Alternatively, the service would have to rely entirely on young people or their families self-referring. We know that this is not feasible on its own, as it would mean only young people who know about the service and are motivated to proactively approach us would get access the service.

Client Service Matching

MSD uses predictive modelling for client service matching because it is a more efficient and effective way of identifying clients who need the most support. Without this modelling, determining who will have a more positive outcome from the type of case management would rely on a set of automated business rules. These business rules would determine which clients are most likely to receive intensive services however they would be less customised to individual client's circumstances and what's likely to work for them.

5.2 Describe any challenges or risks your agency is managing as a result of the use of algorithms described in the previous sections, including whether any decisions where algorithms have been used have ever been challenged.

As with 5.1, drawing on specific examples may help illustrate or provide context to this answer. Within this response, it would be useful to provide examples of cases where decisions that involved the use of algorithms were challenged.

There has been a significant increase in media attention to the use of algorithms in the last 6-12 months, and this often has had negative connotations associated with "machines making decisions". The information we collect about our clients and what we do with it, including our use of algorithms, continues to evolve as our services change and we need to increase our transparency in this area. This, together with the increased negative media

attention, means that there could be concern about the use of algorithms. This could give the public, and our clients, a false impression about how we use algorithms (e.g. that they replace human judgement and decisions). We are addressing this by developing materials that we can share with our clients to simply explain what information we hold about them and what we do with it, including specifically where we use algorithms and how they impact the decisions made about them.

In addition, we need to be aware of any bias or impact on particular groups that may occur as a result of using algorithms. We are increasing our analysis of these issues and aligning with best practices as they emerge.

Youth Service for young people Not in Education, Employment or Training (NEET):

The process includes a specific mechanism to enable providers to request that a young person's rating is changed. When the provider meets with the young person they do their own needs assessment that incorporates qualitative information that isn't used by the model in determining the initial rating. If these needs assessment indicates that the young person has higher (or lower) needs than the rating generated by the model the provider contacts MSD, provides the rationale for changing the rating and in the majority of cases it is changed.

Client Service Matching:

The two models inform which case management stream a client is in and therefore whether they are allocated a case manager who proactively works with them. This case manager can request that a client is removed from active case management, or their participation is put on hold for a period. Clients who are not placed in an active case management stream can access case management on demand and, through a case manager, can access a range of programmes that are available to those in the active case management streams. We are trialling giving clients more choice up front about whether they receive active case management or not to determine whether this has a positive impact on outcomes.

5.3 Considering the responses to 5.1 and 5.2 how does your agency assess the on-going utility of algorithms to its current work?

Algorithms play a key role in supporting many aspects an operational enterprise as we have outlined in this response. They span the range of uses from supporting decision making and operational systems, implementing business rules, and supporting research for policy. Each of these areas supports and is informed by the other. More modern approaches to analytics, such as machine learning and natural language processing, provide further utility to the system by improving processes that are already being performed using traditional business rules or by hand in some cases.

We recognise that as we introduce new techniques that our practice also needs to evolve, especially in areas related to novel or innovative approaches.

5.4 Does your agency anticipate that further algorithm development is likely to be important to delivering better outcomes in the future?

Yes. Immediate areas where this can add value include cases where:

- The volume of work is too large for human intervention. Typically large programs where triage is necessary and it is infeasible for human operators to process all information. Similarly algorithms can undertake less complex tasks giving staff more time to focus on more complex decisions or tasks (as a safe guard, declined decisions could be first reviewed by staff). An example might be managing appointments or call centre streaming.

- Algorithms can work in combination with front-line staff to remove some routine work and allow for time for individual work with our clients. In such cases the combination of algorithms and staff may out-perform each individually and provide better client experience. An example might be allowing staff to navigate the catalogue of available services in the region to more easily facilitate conversations with clients.

5.5 Does your agency expect to develop operational algorithms that rely on AI (artificial intelligence) or machine learning in the future?

Yes, in some circumstances (especially those mentioned in section 5.4) the use of AI can improve the ability to make relevant information available to staff and clients at the time that it is most useful, and in a means that can easily be understood and acted upon.

With ever increasing amounts of information available it is becoming more important to be able to summarise and present details in a consumable way. Our front-line staff are often time constrained and any capability that can mitigate this would be useful to improve client experience.

5.6 Does your agency consider that additional cross-government guidance on the creation and use of algorithms would be helpful?

There are several key aspects of using algorithms that are good candidates for cross-government consideration as they are very likely to contain guidance around practices, standards, or technology that can be re-used:

- Issues related to responsible use, especially as it relates to the practice of developing and operationalising algorithms
- Issues related to sharing data, such as data standards, and sharing data that are critical to developing algorithms.
- Issues related to “codes of practice” such as standards of quality assurance, oversight or sharing of technical implementations, or encouraging acceleration of explainable AI initiatives

5.7 Does your agency consider that it would be useful to be able to seek external, independent, expertise in the creation and use of algorithms?

Yes, in areas where re-use is possible such as:

- Establishing best practices. In this area the practices, in many cases, are new enough that the maturity of using algorithms and machine learning in operational context in government is not well established. Some agencies do have experience and learning that would be useful to share and/or re-use. In this case external expertise can provide an unbiased neutral advice on emerging evidence
- On-going development of algorithms themselves. In this case the technology is well ahead of the practice, and the primary issue is a lack of skilled practitioners. Here, seeking additional expertise is no different than development of other technical solutions.

The operational context of algorithms requires different skill sets including business development and project management to name two. For example, it is becoming far more frequent to view the development of these algorithms in an iterative manner, and although agile practices are relatively mature in IT this is less so in the data and analytics space. In addition, the use of algorithms in an operational context is inherently probabilistic in nature

and there could certainly be more discussion about how these techniques may be routinely used in a business context, particularly from a management and monitoring perspective.

New Zealand Customs Service

Agency Name	New Zealand Customs Service

1. Data Context

Please provide a high-level overview of how your agency collects, analyses and uses data. This should describe (in general terms) how data supports the work of the agency. This should include information about the types of data that the agency collects and uses (not limited to personal information about individuals). Please indicate whether your agency uses data that is collected and/ or controlled by third parties.

This section should ideally be no longer than three or four paragraphs, written for an audience unfamiliar with the work of your agency.

The three main functions Customs undertakes are to:

- Administer and enforce customs controls at the border
- Facilitate trade, travel and the movement of craft through risk management
- Collect revenue including excise and excise-equivalent duty

Customs manages complex border risks by using information. The organisation collects and analyses data in order to effectively and efficiently clear compliant goods, people and craft across the border. In particular, the use of data and analytics allows Customs to identify low and no risk transactions and movements and to apply this knowledge to facilitate high volumes of transactions. This data is also used to allow Customs to collect all due revenue on goods transiting the border or goods on which excise duty and excise-equivalent duty are levied.

Additionally this data is used to identify and mitigate the risks posed by non-compliant goods, people and craft. Customs undertakes this activity for itself and on behalf of a number of other government agencies including overseas partners.

Information is submitted to and collected by Customs from importers, exporters, manufacturers, travellers and vessel owners. Much of the information is submitted through third parties including:

- Customs brokers, including freight forwarders
- Airlines
- Shipping agents

Customs clearance processes require that it discloses data to third parties, both public and private entities, with information sharing appropriate arrangements in place.

2. Operational Algorithms

The main focus of this review is operational algorithms which impact significantly on individuals or groups. These automated processes interpret or evaluate information (often using large or complex data sets) that result in, or materially inform, decisions which impact significantly on individuals or groups. They may use personal information about the individuals or groups concerned but do not need to do so exclusively.

Also, any algorithms that may incorporate AI or Machine Learning fall into this definition. Decisions made by people (e.g. frontline staff) that are informed by such algorithms are in scope, as are automated decisions.

This review seeks to compile as complete and thorough an overview as possible of these types of algorithms.

2.1 Describe the role of operational algorithms used in decision making.

As completely and thoroughly as possible, describe operational algorithms used by your agency. This should include of the scale and scope of algorithm(s) used, and how they affect, or influence, operational decisions within your agency. This may include a count or estimate of the number of algorithms employed and/or a description by category or function.

All arriving and departing passengers and goods are subject to some form of operational algorithm and subsequent analysis. These algorithms assist greatly in the determination and identification of risk and the subsequent facilitation of that traffic which is low risk. In the great majority of cases, Customs intervenes with these flows of people and goods on a risk basis.

There are only very limited operational algorithms which relate to craft as these are risk assessed using a mostly manual process due to the lower volumes and different reporting requirements.

At present, the passenger and goods algorithms are largely developed by intelligence analysts in the Customs Trade and Passenger Targeting Units, based on intelligence held by Customs which relates to past patterns of behaviour and using basic tools such as Excel spreadsheets and database queries. The intelligence used in this target development process includes information about past seizures of drugs and other contraband and past transactions where due revenue has not been properly accounted for.

The resulting operational algorithms consist of a set of rules relating to characteristics of the passengers, goods and craft which are reflected in the data available. These rules make up a targeting profile which is loaded into the Customs computer system (CusMod) for automated checking of incoming transactional data.

When the data relating to a passenger, goods or craft are entered into the Customs system, it is checked against the targeting profile that relates to the particular stream (passenger, goods or craft). Transactions which meet the profile rules are sent into a work queue for consideration by a Customs officer in the trade or passenger targeting team. This Customs officer will review the transaction and may undertake further enquiries if appropriate.

If as a result of further enquiries, the Customs officer assesses the transaction as warranting intervention, an alert (see below under question 4.1 - business rules) will be raised for the transaction and frontline officers will undertake operational activity at the border. This operational activity could consist of asking questions of a passenger, undertaking a baggage search or examining documents or a package or container.

If intervention by a Customs officer results in a risk item or activity being identified, mechanisms also exist to identify associated risk.

In addition to real-time risk assessments, the Customs Service has an established data warehouse system (called Nexus) with an advanced user self-service reporting capability. This allows users to generate complex reports that may be used for a wide range of decision-making purposes. The reporting tools use data selection and data analysis algorithms to prepare the sophisticated reports. Last year over 10,000 different reports were run on Nexus.

Selected trade transactions are reviewed retrospectively by Customs' Trade Intelligence and Trade Assurance teams. These reviews include the use of analytical models and data analysis software to identify the potential underpayment of revenue in transactional data.

Data analysis and forensics software is also used during criminal investigations into Customs offences, to analyse evidence and intelligence including data extracted from computers, phones and other electronic devices used by suspected offenders.

The Customs Business Improvement and Innovation team has been looking at ways to improve customer experience at the border and in connection with the manufacture of goods which attract excise and excise-equivalent duty. This work has included the development of customer segmentation models, incorporating algorithms, for excise, trade and travellers which seek to group Customs' customer base by what they need, their behaviours and compliance intent.

This customer segmentation allows Customs to focus on the interplay between our traditional risk-based approach and a combined risk and customer experience approach in support of the Compliance & Customer Framework.

2.2 If possible, please include an example or examples for illustration.
Examples might describe a particular algorithm that reflects a larger number of similar processes, from data collection through to decision making, which focus on decisions that impact individuals or groups. Specific assurances and safeguards should be described, and the scale and scope of application noted.

One long-running targeting profile focusses on air cargo consignments (goods arriving by plane) which may carry a risk of prohibited or restricted goods (such as drugs, tobacco, intellectual property infringements, unsafe goods) or revenue evasion and which originate in one region of world. The targeting profile consists of a large number of individual sets of rules (approximately 30) which target clusters of risk.

The rules separate out consignments from the targeted region and within that population of goods identify the packages which have characteristics, shown by the available data fields, which match the known risk criteria. These known risk criteria can include weight, value, goods description, tariff items, port of loading, components of consignor and consignee details.

Transactions and goods which meet the risk criteria are then evaluated or examined by Customs as part of the standard risk assessment process.

Targeting profiles operate in the same way in the passenger streams with rules developed based on the information available about previous risk passenger activity and focussed on the data provided by passengers and airlines in relation to passenger movements.

Another example, from Customs' business improvement work, is the development of the Customs website using personae based on customer segmentation models. This has allowed the navigation of the website by customers to be constructed in a way which influences the way in which customers consume information and increases regulatory understanding and compliance.

2.3 Who designed or created the algorithms described in response to 2.1 and 2.2 (internal staff, external providers?)
It may be helpful to indicate where the agency sought legal advice relating to the design and/or procurement of algorithms.

Customs officers, particularly intelligence analysts, are responsible for developing the algorithms in the targeting profiles and rules in conjunction, where appropriate, with overseas border agency partners.

The customer segmentation work has been undertaken using internal and external (privately contracted) expertise.

An essential component of the development of all algorithms in Customs is the involvement of subject matter experts who are able to validate the analytical output.

2.4 Detail any assurance processes, or related safeguards used in conjunction with algorithms described in response to 2.1.
If the agency has a written policy related to automated decision making or the use of algorithms it may be helpful to cite this along with the role of human intervention and discretion. It may also be helpful to describe the nature of the data sets/ sources that are utilised and any records that are maintained so that the operation of the algorithm can be explained including what information is taken into account for the purposes of making any decisions. Examples of assurance should include data management, oversight, or other governance that support responsible use.

Risk identified as a result of an algorithm is analysed by staff who then make recommendations on intervention. For example, all passenger alerts must meet a pre-requisite criteria and be signed-off prior to implementation at an appropriate level in Customs management. There is a written policy in this regard. The Customs computer system (CusMod) maintains a record of this decision-making process.

The customer segmentation model is governed by Customs Compliance and Customer Framework and Enforcement strategy.

3. Policy Development and Research

This includes analytical tools used to analyse large and varied data sets to identify patterns and trends and to support policy development or to model potential interventions. The key distinction between these and operational algorithms is that they have no direct or significant impact on individuals or groups. They may inform policy development but have no significant impact on service delivery. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes**.**

3.1 Describe how algorithms are used in policy development and research.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of policy or research that they inform.

The use of algorithms in policy development and research at Customs is fairly limited. Customs generally uses operational intelligence, data and information to inform policy development.

However, we have used models to assess the economic impacts of different policy settings. This includes, for example, cost benefit analyses in support of Budget bids and estimating the economic impacts of different settings for collecting GST on low value goods.

3.2 If possible, please include an example or examples for illustration.

Customs undertook a cost benefit analysis exercise to support its Budget 2018 bid "Strategic Disruption of Drug Supply Chains".

This involved modelling the potential reduction in harms caused by the consumption of illicit drugs in New Zealand. This model combined the expected impacts of the initiative on seizures, and consequent availability for consumption, likely criminal and user behaviours, and the costs impacts of the harms caused by drugs.

4. Business rules

These are simple algorithms created by people that use rules to constrain or define a business activity to make determinations about individuals or groups, without a significant element of discretion. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes.

4.1 Describe the role of operational business rules used in decision making.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of decisions that they inform.

Various units within Customs are tasked with the development and implementation of business rules - simple algorithms, which enable determinations to be made about the clearance of individuals and groups. These relate to the activities identified in the answer provided to question 1 above (data context).

The Customs computer systems also contain business rules created by other agencies for their operational purposes which are implemented by Customs at the New Zealand border.

Further information, including several examples, is provided in the response to question 4.2 below.

4.2 If possible, please include an example or examples for illustration.

Every electronic Customs entry for goods is assessed automatically on being submitted to see whether the fields are adequately completed and rejected if it does not meet the right data standard. This is an automated decision regarding whether the entry meets the data standards rather than determining if the information supplied correct. Where an entry is rejected, the importer or their agent is able to re-lodge the entry once the issue with the information is resolved.

Once an entry is successfully lodged, it is then checked against the profiles and rules described in the response to question 2.1 above (operational algorithms).

The information for every incoming and outgoing passenger is checked against a list of passengers on "alert" and passengers whose data match an alert are placed in a work queue for the appropriate actions to be taken – this may be an exact name match or a near name match depending on the process and tools used.

The Customs computer system (CusMod) also contains alerts placed by other government agencies such as the Ministry for Primary Industries (Biosecurity), Ministry of Justice, Corrections and New Zealand Police. Whilst alerts raised for Customs purposes are validated and approved by Customs managers, alerts created and loaded at the request of other agencies are not validated by Customs.

Basic randomiser tools have been developed for the Customs Assurance programme and are currently in use in the air passenger, air cargo and mail streams.

The Assurance programme is a new area of work for NZ Customs. It involves undertaking randomised sampling across the various import pathways – cargo, mail passenger and craft (sea) with a total of 12,500 samples annually. The basic randomiser tools are used to select goods and passengers to undergo an assurance process as part of the random sampling programme.

The basic randomiser tools currently being used in the air cargo, mail and air passenger streams have been created using Excel spreadsheets.

The randomiser for air cargo uses a database query to pull all the electronic cargo information within a specific time period which relates to air cargo and places it into an Excel spreadsheet. Workbooks created in Excel for specific phases of the random sampling and assurance activity then make the selection from the first Excel spreadsheet.

The randomisers used for mail and air passengers are contained in single Excel workbooks.

A more integrated random sampling tool will shortly be developed as part of Customs' new Risk and Intelligence system.

Another example of a business rule is the eGate system currently used at international airports in New Zealand. It undertakes the electronic validation of passports and confirms that the person presenting the passport is the actual passport holder by using a facial recognition algorithm. The eGates also apply CusMod alerts (including those implemented on behalf of other government agencies) to identify passenger risk at the border and refer travellers to Customs officers for further assessment and action where required. This automated process enables Customs to process a large numbers of passengers in an efficient manner whilst managing border risk.

5. Utility and Future Use

5.1 Describe any benefits or expected impact generated through the use of algorithms described in the previous sections.
It may be helpful to draw on the specific examples provided previously to explain how the analysis or service delivery in question was conducted prior to the application of algorithms, and related analytical tools, in order to quantify any efficiencies or improvements that have occurred as a result.

The use of operational algorithms and business rules in Customs for compliance and facilitation purposes has delivered extensive benefits over a number of years.

Facilitation

The automated assessment of transaction data has also helped maintain Customs and government processing costs at an affordable level, against unprecedented growth, particularly at Auckland International Airport. In the 2016/2017 reporting year, operational algorithms have enabled:

1. The facilitation of 5.8 million or 45% of air passengers processed through eGate automated passenger processing
2. The processing of 99.9% of trade transactions within 30 minutes (other than those referred for compliance checks)

Through application of the customer segmentation model, Customs is able to create more efficient and effective services by better understanding the end users of our services to help influence greater levels of voluntary compliance by those entities that have to comply with our regulatory requirements.

For example, eGate experiences and the services offered have been tailored through the application of the customer segmentation model developed by Customs' Business Improvement & Innovation group. In particular, the customer types and typical behaviour identified in the segmentation model helped to inform the location of eGates in the airport terminals and where they are placed relative to the officer booths on the primary processing line.

The Trade Single Window and associated systems identifies legitimate trade at an early stage and provides predictability for the supply chain.

Compliance

In the 2016/2017 reporting year, these operational algorithms and business rules contributed to:

1. The avoidance of up to $1.15 billion in potential harm (social and economic costs) avoided to New Zealand through illicit drugs seized by Customs
2. The prevention of up to $13.4 million of harm through interceptions at the border of other unlawful activity (such as seizures of objectionable material and weapons and attempted evasion of duty)
3. The interception of up to 44,520 individual counterfeit goods items at the border

Whilst not all interceptions of illicit drugs and other unlawful activity result from targeting rules or alerts informed by Intelligence, the application of algorithms to data supplied to Customs plays a very significant role in the management of risk in all streams except the mail stream. Work by Customs' Integrated Targeting and Operations Centre (ITOC) to refine risk profiles between 2014-2016 delivered the following benefits with input from Customs' analytics practitioners:

1. A reduction in the number of legitimate consignments stopped by inspection by 45%, during a period when trade levels increased by 57%,
2. An increase in the volumes of methamphetamine, ephedrine and pseudoephedrine seizures by 245% and the social harm prevented by 378%.

Assurance activity enabled by the random sampling tools will allow Customs to:

- Use statistical evidence to inform and refine Customs Intelligence.
- Provide a level of confidence that we are targeting risk effectively (or not).
- Prove statements we make about compliance and non-compliance with supporting data.
- Improve compliance levels by understanding the reasons for non-compliance.
- Enable a future where Customs officers will know more about what they are looking for (what is normal and what is not) and have higher success rates.

Assurance provides the missing piece of the intelligence picture, a control group looking at the unknown parts of the populations. It complements our targeting and profiling regimes and will assist Customs in achieving our strategic goal of being an Intelligence Led organisation.

Overall, this means the organisation will be better able to target resources to areas of greater risk to Customs and more broadly, the Border Sector, essentially entities that are deliberately non-compliant, or intentionally criminal. Better customer experiences also help to promote NZ's economy through reduced compliance costs for businesses and the efficient flow of legitimate trade and travel.

5.2 Describe any challenges or risks your agency is managing as a result of the use of algorithms described in the previous sections, including whether any decisions where algorithms have been used have ever been challenged.
As with 5.1, drawing on specific examples may help illustrate or provide context to this answer. Within this response, it would be useful to provide examples of cases where decisions that involved the use of algorithms were challenged.

Customs is careful to ensure that the algorithms used are not prejudicial and do not unfairly affect individuals or groups. All Customs processes involve careful consideration of how to balance the rights of the community it interacts with and using technology to facilitate at greater efficiency that same community.

The Customs' Assurance programme is focussed on improving the quality of compliance data available to Customs and reducing any bias in that data through random sampling.

5.3 Considering the responses to 5.1 and 5.2 how does your agency assess the ongoing utility of algorithms to its current work?

The passenger and trade targeting teams review the effectiveness of their targeting profiles and rules and remove profiles and rules which are not effective or not working as intended.

Alerts which identify specific travellers or transactions for Customs purposes are similarly reviewed to ensure that they remain relevant and appropriate.

The performance of the eGate algorithms is reviewed on a monthly basis.

5.4 Does your agency anticipate that further algorithm development is likely to be important to delivering better outcomes in the future?

Yes, as scientific and technology enhancements increase in this area, Customs believes it can deliver better outcomes in the future in respect of its mandated role as the guardian of New Zealand's border.

See in particular the response to question 5.5 below.

5.5 Does your agency expect to develop operational algorithms that rely on AI (artificial intelligence) or machine learning in the future?

Customs is currently in the process of developing operational algorithms relying on machine learning in the Joint Border Analytics team.

Customs also expects to develop operational algorithms relying on artificial intelligence but that is likely to be at least 12 months away. Artificial intelligence is most likely to be used in connection with a "digital concierge" type system for border users and automatic recognition of risk items in X-ray images.

The Joint Border Analytics (JBA) team was established in late 2016 and consists of staff and contractors from Customs, the Ministry for Primary Industries and the Ministry of Business, Innovation and Employment (Immigration NZ). Data modellers, data scientists, data wranglers and business analysts are working together in the JBA team, with input from subject matter experts, to gain new insights into border risk through the use of analytics software and data sharing.

A number of Customs projects currently being undertaken in the JBA team apply machine learning techniques. In this context, machine learning facilitates the accumulation of knowledge from historical datasets that represent the experiences of the organisation in the past. Learning from the past is key to achieving greater operational efficiencies and effectiveness in ensuring the mitigation of risk to New Zealand and its citizens. Using technology to explore automated ways to utilise large volumes of data will ensure that the organisation can keep pace with the growing volumes of goods and passengers crossing New Zealand's borders every day.

The Customs analytics projects currently under way in the JBA team are as follows:

1. **Air passenger (non-compliance) project** – developing insights into historical non-compliance at the New Zealand border in the Customs, MPI and MBIE contexts and developing models which will help to predict future non-compliance by arriving air passengers. This project includes the development of an entity resolution algorithm to match data relating to the same passenger and prevent duplication in the derived datasets.

2. **Passenger flow project** – forecasting passenger flow and volumes for the next 4 years to inform rostering, workforce strategy, funding decisions and other operational and strategic decision making

3. **Methamphetamine, Ephedrine and Pseudoephedrine Project (MEP 2.0) –** building on an earlier pilot project targeting methamphetamine, ephedrine and pseudoephedrine in the air cargo stream with a view to developing models and rules which will target drug risk and deriving insights about drug importations through this stream. This project includes the development of an address tokenisation and validation algorithm which will enable the automated mapping of the intended destination for drugs seized at the New Zealand border.

4. **Darknet markets analysis** – using an open source dataset of Darknet market listings to derive insights into the availability of illicit drugs and other contraband and risk products through Darknet retailers and patterns, trends and changes in that market from 2014-2016 for intelligence purposes.

5. **Sea cargo risk project –** developing an analytical model and rules for use in targeting risk goods in the sea cargo consignments (containers)

6. **Revenue project –** developing models and other tools for identifying revenue risk in trade imports (in collaboration with Customs' trade intelligence team).

Currently there are no models or rules developed by the Joint Border Analytics team in operational use.

To ensure that data and analytical techniques are appropriately and safely used by the Joint Border Analytics team, a number of processes and controls are in place including:

- Project scope is defined, documented and agreed
- Legal advice is sought from agency legal teams and/or the Crown Law Office, as appropriate
- A privacy impact assessment is developed
- A data provisioning request is made to the relevant agency data steward
- Data is classified where necessary
- All staff are appropriately security cleared

- The Offline Analytics Environment (used for the development of analytical products) has appropriate security controls built into it
- Permission must be sought for the removal of data and analytical outputs from the Offline Analytics Environment
- Models, rules and other products are peer reviewed, validated by subject matter experts and/or subjected to a “test and learn” phase before full operational deployment
- Models, rules and other products are deployed into the standard Customs’ risk management process (as described in the answer to question 2.1 above) as a decision support tool rather than creating an automated decision-making process
- The performance of models, rules and other products will be monitored and the models, rules and other products refreshed, reviewed and refined at appropriate intervals

5.6 Does your agency consider that additional cross-government guidance on the creation and use of algorithms would be helpful?

Yes – Customs would value additional cross-government guidance on the creation and use of algorithms.

Customs has already taken a range of steps to access and support the development of best practice across the public sector including:

- Setting up the Government Analytics Network, with support from Statistics NZ and the Social Investment Agency, to facilitate the sharing and development of best practice
- Participating in the Border 5 Data Analytics Working Group and Targeting Working Groups which facilitate the sharing and development of best practice across operational data analytics capabilities in border agencies in Australia, Canada, New Zealand, the United Kingdom and the United States
- Participating in research into predictive risk modelling which has been undertaken by the Office of the Privacy Commissioner and research into the use of data and analytics undertaken by the Office of the Auditor General
- Engaging with the office of the Government Chief Privacy Officer and the Office of the Privacy Commissioner in connection with the work of the Joint Border Analytics team
- Engaging experts from the private sector to participate in the development and delivery of Joint Border Analytics projects

As such, Customs would be an active participant in any cross–government forum developing such best practice guidelines.

5.7 Does your agency consider that it would be useful to be able to seek external, independent, expertise in the creation and use of algorithms?

Yes. As set out in the answer to question 5.6 above, Customs has engaged extensively with other New Zealand government agencies, legal and privacy advisers, private sector providers and counterparts in other border agencies internationally and will continue to do so.

Any mechanisms which facilitate access to external, independent expertise of this type would be welcomed. For example, a panel of data science providers could be useful.

New Zealand Police

Agency Name	New Zealand Police

1. Data Context

Please provide a high-level overview of how your agency collects, analyses and uses data. This should describe (in general terms) how data supports the work of the agency. This should include information about the types of data that the agency collects and uses (not limited to personal information about individuals). Please indicate whether your agency uses data that is collected and/ or controlled by third parties.

This section should ideally be no longer than three or four paragraphs, written for an audience unfamiliar with the work of your agency.

The purpose of New Zealand Police is for everyone to be safe and feel safe. We aim to achieve this by providing the best possible service to our communities every day.

Police primarily collects operational and administrative data to support effective delivery of its services and core activities - prevention, response, investigation and prosecution. Key datasets owned and collected by Police include data about victimisations, police proceedings, police demand and activities, communication centre transactions, and finance.

This data is analysed and used to support the effectiveness and efficiency of operations, measure operational and system performance, inform improvement opportunities, and support policy development and interventions. Anonymised and aggregated information about crime is used by Police to support official statistics, research and evaluation.

Police works collegially with a number of public and private sector agencies in the strategic and operational fields and may access various third party data. Examples of third party data accessed and used includes data from the Department of Corrections (on people under Corrections management), Ministry of Justice (court information about individual cases), etc.

2. Operational Algorithms

The main focus of this review is operational algorithms which impact significantly on individuals or groups. These automated processes interpret or evaluate information (often using large or complex data sets) that result in, or materially inform, decisions which impact significantly on individuals or groups. They may use personal information about the individuals or groups concerned but do not need to do so exclusively.

Also, any algorithms that may incorporate AI or Machine Learning fall into this definition. Decisions made by people (e.g. frontline staff) that are informed by such algorithms are in scope, as are automated decisions.

This review seeks to compile as complete and thorough an overview as possible of these types of algorithms.

2.1 Describe the role of operational algorithms used in decision making.

As completely and thoroughly as possible, describe operational algorithms used by your agency. This should include of the scale and scope of algorithm(s) used, and how they affect, or influence, operational decisions within your agency. This may include a count or estimate of the number of algorithms employed and/or a description by category or function.

Police currently uses few 'operational algorithms' to support the cumulative assessment frontline staff make at initial scene attendance and for follow-up safety actions. These algorithms are part of the assessment along with officer's interaction with the people involved and any investigation that has been undertaken. For both Family Harm investigations and with victimisations, these algorithms are supported by graduated response models to support officers in taking safety action with and for the people involved. They have been designed to support informed decision making, to raise awareness of risks people are exposed to, to support preventive actions, and the safety of the people involved. While these operational algorithms indicate a level of concern for safety or level of risk all final decisions about actions and interventions are made at the discretion of the officer or a collections of officers.

2.2 If possible, please include an example or examples for illustration.
Examples might describe a particular algorithm that reflects a larger number of similar processes, from data collection through to decision making, which focus on decisions that impact individuals or groups. Specific assurances and safeguards should be described, and the scale and scope of application noted.

Example 1: Youth Offending Risk Screening Tool (YORST)
Standardised risk and needs assessment and/or screening of young offenders are recognised internationally as best practice.
YORST is a risk screening/assessment instrument developed by Police with the help of external experts to improve the quality of youth justice decision-making. YORST was rolled out nationally in July 2009 following a favourable evaluation of the pilot.
This algorithm is based on a questionnaire, including questions about education, living situation, parent offending history, and past recorded events such as time since last incident, time since last offence, total number of previous offences.

Example 2: Family violence risk assessment tools
-STATIC RISK (**SAFVR**)
This algorithm calculates the probability that a family violence perpetrator will commit a crime against person (in the context of family violence) within the next two years given the officer is at a family harm investigation at the time the SAFVR measure is considered (the algorithm shows the aggressor as low, medium, or high risk). This algorithm is based on data held in Police systems and includes characteristics of the offender such as gender, past incidents of family harm or criminal history, and characteristics of current offending.

- DYNAMIC RISK MEASURE which asks a series of questions at initial scene attendance to determine a dynamic risk level. These questions are based on research from in New Zealand and overseas and are strong indicators that violence is escalating or likely to occur again.

The static measure is combined with the dynamic risk level to create an overall level of concern for safety for the people involved. Responders are guided to a graduated response model of safety actions; the higher the level of concern for safety, the greater the level of safety action the responders take with and for the victim, any children and the aggressor.

The SAFVR measure and DYNAMIC RISK assessment are complementary and used only in the context of a family harm investigation. This assessment contributes to an officer's cumulative assessment of harm along with the investigation they undertake at the scene to support optimum actions that ensure the safety of the family members and prevent further harm.
These assessments are in keeping with the Risk Assessment and Management Framework for Family Violence and Sexual Violence.

Example 3: VICTIM HISTORY SCORECARD (VHS)

VHS is a victim support tool developed by Police. The purpose of the VHS is to flag to officers serious or repeat victimisation within a rolling 12 month period to assist in an understanding of cumulative harm a victim is subjected to. The VHS is not proven scientifically but reflects the typical value judgement of police officers about the level of victimisation risk a victim has, and classifies victims as having high, medium or low victimisation risk. The VHS is used when a call for service arrives, to inform choices about the appropriate response and support for victims and also for ongoing support for victims who are exposed to chronic or cumulative harm over a rolling 12 month period. This assessment is supported by a Graduated Response Model, which guides supportive

2.3 Who designed or created the algorithms described in response to 2.1 and 2.2 (internal staff, external providers?)
It may be helpful to indicate where the agency sought legal advice relating to the design and/or procurement of algorithms.

The operational algorithms described above were all developed by Police, with some support from specialist contractors. A Privacy Impact assessment has been undertaken by the Safer Whanau team in regards to the Family Harm IT solution which also includes the SAFVR measure and Dynamic Assessment. The algorithms are based from information Police have access to as a matter of course

2.4 Detail any assurance processes, or related safeguards used in conjunction with algorithms described in response to 2.1.
If the agency has a written policy related to automated decision making or the use of algorithms it may be helpful to cite this along with the role of human intervention and discretion. It may also be helpful to describe the nature of the data sets/ sources that are utilised and any records that are maintained so that the operation of the algorithm can be explained including what information is taken into account for the purposes of making any decisions. Examples of assurance should include data management, oversight, or other governance that support responsible use.

As per 2.1. While these operational algorithms indicate a level of concern for safety or level of risk all final decisions about actions and interventions are made at the discretion of the officer or a collections of officers

Police Data and Information Steering Group (DISG) coordinates NZ Police strategies, practices and improvement programmes concerning data and information (both operational and corporate) and ICT services. Data quality assurance is maintained by Police Data Quality Working Group which coordinates actions to address and identify data quality problems. The DQA applies to data used for current algorithms.

The Safer Whanau Steering Committee has executive oversight of the SAFVR and the Dynamic Risk questions associated with the Family Harm IT solution.

No specific governance of existing operational algorithms is in place, however algorithm development have been overseen by the Business Senior Executive, with involvement of the Police Chief Data Scientist and external specialist contractors. These algorithms are evaluated regularly to ensure their validity.

3. Policy Development and Research

This includes analytical tools used to analyse large and varied data sets to identify patterns and trends and to support policy development or to model potential interventions. The key distinction between these and operational algorithms is that they have no direct or significant impact on individuals or groups. They may inform policy development but have no significant impact on service delivery. This review seeks input from agencies which

provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes**.**

3.1 Describe how algorithms are used in policy development and research.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of policy or research that they inform.

Police uses a range of analytical tools and approaches to analyse large datasets to support policy development, to monitor business performance, or to provide insights. This includes descriptive statistics, modelling impacts of interventions and policy, making prediction, forecasting crime volume and scheduling, etc.

3.2 If possible, please include an example or examples for illustration.

One of our studies evaluated the effectiveness of pre-charge warnings (PCW) as an alternative method resolution toward reducing burden of offending. The study question was: "Does Pre-charge warning contribute to reducing offenders likelihood of recidivism? Results from this study showed that people who received a PCW for eligible offences were less likely to re-offend compared with those who had been prosecuted against. These findings imply PCWs contributed to reducing the burden of crime on our justice system as well as improved outcome for individuals involved.

4. Business rules

These are simple algorithms created by people that use rules to constrain or define a business activity to make determinations about individuals or groups, without a significant element of discretion. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes.

4.1 Describe the role of operational business rules used in decision making.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of decisions that they inform.

Business rules are extensively used by Police, both automated and non-automated in Police decision making.
Broadly these fall into areas of operational policy or guidance, and recording rules (i.e. when decisions are made, this is what must be recorded).

The training provided to Police staff for Safer Whanau highlighted that the SAFVR and the dynamic questions for Family Harm are tools to be used as part of the officer's cumulative assessment, along with a quality family harm investigation, to determine the level of concern for safety.

4.2 If possible, please include an example or examples for illustration.

Business rule example (automated):
Initial File Assessment of only certain types of file to determine whether to investigate, or close the case early.
This rule is designed to eliminate unproductive follow-up and multiple file handling & recording so that resources may be concentrated on cases which are likely to yield results. The system is based on the absence of viable leads at the time a complaint is initially received, either at a police office or at the conclusion of the initial attendance.
Scores are recorded for three key investigation elements (system codified). These add to a total, which if over a threshold prohibits early case closure. If under the threshold, investigation can still be directed by recording text of 'Other factors that make investigation desirable despite low IFA score'.

5. Utility and Future Use

5.1 Describe any benefits or expected impact generated through the use of algorithms described in the previous sections.
It may be helpful to draw on the specific examples provided previously to explain how the analysis or service delivery in question was conducted prior to the application of algorithms, and related analytical tools, in order to quantify any efficiencies or improvements that have occurred as a result.

The main benefits of operational algorithms currently in use are to:

- Support optimum outcomes for individuals and communities by improving the effectiveness of decision making, consistency of decisions, and more appropriate interventions
- Support best use and efficiency of limited Police resources

The combination of algorithm use with final human authority on decision making is recognised to provide the best balance of achieving benefits while minimising risk.

5.2 Describe any challenges or risks your agency is managing as a result of the use of algorithms described in the previous sections, including whether any decisions where algorithms have been used have ever been challenged.
As with 5.1, drawing on specific examples may help illustrate or provide context to this answer. Within this response, it would be useful to provide examples of cases where decisions that involved the use of algorithms were challenged.

It is important to reinforce with our staff that algorithms are one of the tools we have available to us to support good decision making and to help inform our cumulative assessment of risk / safety; however these tools also need to be supported by good quality investigation practice and professional judgement.

5.3 Considering the responses to 5.1 and 5.2 how does your agency assess the ongoing utility of algorithms to its current work?

The Police is committed to the principles for the safe and effective use of data and analytics. The combination of algorithm use with final human authority on decision making is recognised to provide the best balance of achieving benefits while minimising risk.
5.4 Does your agency anticipate that further algorithm development is likely to be important to delivering better outcomes in the future?
Through increasing use of analytics and insights Police aims to deliver improved services. Police continues to strengthen its business intelligence, information management and standardised practices across the organisation.
5.5 Does your agency expect to develop operational algorithms that rely on AI (artificial intelligence) or machine learning in the future?
Yes. Police is currently exploring automation proof of concepts involving aspects of AI. Other proof of concept work is likely in the future.
5.6 Does your agency consider that additional cross-government guidance on the creation and use of algorithms would be helpful?
Police welcomes any additional cross-government guidance that would support the appropriate development and use of algorithms to enable delivery of better outcomes for all New Zealanders.
5.7 Does your agency consider that it would be useful to be able to seek external, independent, expertise in the creation and use of algorithms?
External independent expertise has been used to help develop, peer review or evaluate algorithms described earlier..

Oranga Tamariki

Agency Name	Oranga Tamariki

1. Data Context

Please provide a high-level overview of how your agency collects, analyses and uses data. This should describe (in general terms) how data supports the work of the agency. This should include information about the types of data that the agency collects and uses (not limited to personal information about individuals). Please indicate whether your agency uses data that is collected and/ or controlled by third parties.

This section should ideally be no longer than three or four paragraphs, written for an audience unfamiliar with the work of your agency.

As an operational agency, Oranga Tamariki collects a wide range of information about the children we work with, and uses this data for operational purposes including, for example, provision of services, and matching with caregivers.

This data is also used for regular management and (in aggregate) performance reporting, including at the site, region, and national levels.

The data is used to guide policy-making, such as estimating the size of demand for potential services or understanding geographic distributions. This data is also supplemented by work done within the IDI, which enables non-operational linking between our own operational data and other data within the IDI.

2. Operational Algorithms

The main focus of this review is operational algorithms which impact significantly on individuals or groups. These automated processes interpret or evaluate information (often using large or complex data sets) that result in, or materially inform, decisions which impact significantly on individuals or groups. They may use personal information about the individuals or groups concerned but do not need to do so exclusively.

Also, any algorithms that may incorporate AI or Machine Learning fall into this definition. Decisions made by people (e.g. frontline staff) that are informed by such algorithms are in scope, as are automated decisions.

This review seeks to compile as complete and thorough an overview as possible of these types of algorithms.

2.1 Describe the role of operational algorithms used in decision making.

As completely and thoroughly as possible, describe operational algorithms used by your agency. This should include of the scale and scope of algorithm(s) used, and how they affect, or influence, operational decisions within your agency. This may include a count or estimate of the number of algorithms employed and/or a description by category or function.

Oranga Tamariki does not currently deploy any operational algorithms for use in decision making.

2.2 If possible, please include an example or examples for illustration.

Examples might describe a particular algorithm that reflects a larger number of similar processes, from data collection through to decision making, which focus on decisions that impact individuals or groups. Specific assurances and safeguards should be described, and the scale and scope of application noted.

N/A

2.3 Who designed or created the algorithms described in response to 2.1 and 2.2 (internal staff, external providers?)

It may be helpful to indicate where the agency sought legal advice relating to the design and/or procurement of algorithms.

N/A

2.4 Detail any assurance processes, or related safeguards used in conjunction with algorithms described in response to 2.1.

If the agency has a written policy related to automated decision making or the use of algorithms it may be helpful to cite this along with the role of human intervention and discretion. It may also be helpful to describe the nature of the data sets/ sources that are utilised and any records that are maintained so that the operation of the algorithm can be explained including what information is taken into account for the purposes of making any decisions. Examples of assurance should include data management, oversight, or other governance that support responsible use.

N/A

3. Policy Development and Research

This includes analytical tools used to analyse large and varied data sets to identify patterns and trends and to support policy development or to model potential interventions. The key distinction between these and operational algorithms is that they have no direct or significant impact on individuals or groups. They may inform policy development but have no significant impact on service delivery. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes**.**

3.1 Describe how algorithms are used in policy development and research.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of policy or research that they inform.

Policy development and research is supported by project-specific analysis of our operational and IDI data, including through our lifetime child wellbeing model.

3.2 If possible, please include an example or examples for illustration.

As an example, in scoping the potential scope for intensive intervention services for families, we analysed data on children entering the care system in comparison to those who neared but did not enter, in both our operational data and within the IDI.

4. Business rules

These are simple algorithms created by people that use rules to constrain or define a business activity to make determinations about individuals or groups, without a significant element of discretion. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes.

4.1 Describe the role of operational business rules used in decision making.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of decisions that they inform.

Oranga Tamariki makes extensive use of business rules in order to ensure consistency in reporting and standardised definitions for terms which would otherwise be open to broad interpretation.

4.2 If possible, please include an example or examples for illustration.

As an example, a business rule is required to clarify whether a child is considered to have exited a placement and returned, or whether it is a single unbroken placement episode. The business rule formalises how long a child must have left placement for in order for the overall placement episode to have ended.

5. Utility and Future Use

5.1 Describe any benefits or expected impact generated through the use of algorithms described in the previous sections.
It may be helpful to draw on the specific examples provided previously to explain how the analysis or service delivery in question was conducted prior to the application of algorithms, and related analytical tools, in order to quantify any efficiencies or improvements that have occurred as a result.

Without using operational and IDI data, it would be impossible to reliably plan, cost, or provide recommendations around future service development based on sound evidence and understanding of New Zealand's children and families.

5.2 Describe any challenges or risks your agency is managing as a result of the use of algorithms described in the previous sections, including whether any decisions where algorithms have been used have ever been challenged.
As with 5.1, drawing on specific examples may help illustrate or provide context to this answer. Within this response, it would be useful to provide examples of cases where decisions that involved the use of algorithms were challenged.

Any strategic or policy decisions / advice provided through the use of our data, including the wellbeing model, always involves balancing what the data appears to suggest with the experiences of front line practitioners and other skill sets, to ensure that data can be interpreted and challenged as correctly as possible. As we do not use algorithms for operational decision making, these decisions have never been challenged.

5.3 Considering the responses to 5.1 and 5.2 how does your agency assess the ongoing utility of algorithms to its current work?

N/A

5.4 Does your agency anticipate that further algorithm development is likely to be important to delivering better outcomes in the future?

Further interrogation of the data available to the Ministry will be critical for the continuous improvement of our services and corresponding outcomes for children. At present, we have no plans for development of front line operational decision making algorithms.
5.5 Does your agency expect to develop operational algorithms that rely on AI (artificial intelligence) or machine learning in the future?
At present, we have no plans for development of front line operational decision making algorithms.
5.6 Does your agency consider that additional cross-government guidance on the creation and use of algorithms would be helpful?
Yes, formal guidance on best practice in the deployment of operational algorithms would be of value in supporting any future conversations on potential development of these.
5.7 Does your agency consider that it would be useful to be able to seek external, independent, expertise in the creation and use of algorithms?
Yes – as above.

Social Investment Agency

Agency Name	Social Investment Agency (SIA)

1. Data Context

Please provide a high-level overview of how your agency collects, analyses and uses data. This should describe (in general terms) how data supports the work of the agency. This should include information about the types of data that the agency collects and uses (not limited to personal information about individuals). Please indicate whether your agency uses data that is collected and/ or controlled by third parties.

This section should ideally be no longer than three or four paragraphs, written for an audience unfamiliar with the work of your agency.

SIA uses data and evidence to inform how the social sector can best improve the lives of New Zealanders by investing in what is known to create the best results. As part of this we undertake research, analysing data to gain insight into the effectiveness of an intervention or to better understand the needs of different segments of the population. To disseminate our findings to those who would benefit from them SIA publishes papers and code, and develops new ways of visualising data.

The primary data source SIA uses for its research is the Integrated Data Infrastructure (IDI) provided by Statistics NZ (SNZ). This gives us access to individual level data within a secure environment. All IDI data is summarised, confidentialised according to SNZ rules, and submitted for checking by trained SNZ staff prior to its release from the secure environment. In addition to IDI data, we also draw on information that is freely available online such as maps of New Zealand regions and published official statistics.

Although we are principally a user of data in the IDI we are always looking to identify gaps in the available data, and what would be required to fill such gaps. For example, we have engaged with primary health organisations to explore the value of having their data added to the IDI.

SIA does very little explicit data collection. One example is in mid-2018: SIA is talking with people and organisations around New Zealand to find out what they think about the Government's proposed approach to investing for social wellbeing, and the protection and use of personal information in the social sector. As part of this engagement SIA is collecting responses and key points from the discussions.

The Data Exchange is a software tool that facilitates that smooth sharing of data between different social sector agencies (for example: NGO service providers have used the exchange to send contract reporting information to MSD). As the operator of the Data Exchange, SIA is responsible for ensuring the Data Exchange is fit-for-purpose and for helping organisations connect to the exchange.

2. Operational Algorithms

The main focus of this review is operational algorithms which impact significantly on individuals or groups. These automated processes interpret or evaluate information (often using large or complex data sets) that result in, or materially inform, decisions which impact significantly on individuals or groups. They may use personal information about the individuals or groups concerned but do not need to do so exclusively.

Also, any algorithms that may incorporate AI or Machine Learning fall into this definition. Decisions made by people (e.g. frontline staff) that are informed by such algorithms are in scope, as are automated decisions.

This review seeks to compile as complete and thorough an overview as possible of these types of algorithms.

2.1 Describe the role of operational algorithms used in decision making.

As completely and thoroughly as possible, describe operational algorithms used by your agency. This should include of the scale and scope of algorithm(s) used, and how they affect, or influence, operational decisions within your agency. This may include a count or estimate of the number of algorithms employed and/or a description by category or function.

SIA does not use any algorithms that make operational decisions in place of a human decision maker, or that narrow the scope of operational decisions available to a human decision maker.

All of the code tools and algorithms that SIA uses for research are either to automate the processing of data at the instruction of its staff, or to support the visualisation of data as part of making information available and accessible to decision makers. The way these algorithms have an impact on operational decisions is via reports and publications. These algorithms are discussed further in section 3.

The Data Exchange is used only for the transmission of data. What gets transmitted and how this data is used in decision making is determined by the sending and receiving agencies. SIA acts as a facilitator helping organisations establish their own connection to the Data Exchange. Hence we are confident that the exchange is out of scope for this stocktake. Please contact SIA directly if you require further details on the Data Exchange.

In our research undertakings, SIA has made use of several algorithms that can be classified as AI or machine learning algorithms. In particular:

- Regressions (linear and logistic) have been used in several impact evaluation studies.
- K-means and random forest have both been used to identify population segments as part of exploratory data analysis.
- Random forest and gradient boosting have both been used for propensity score matching – for ensuring that treatment and control populations are as comparable as possible.

2.2 If possible, please include an example or examples for illustration.

Examples might describe a particular algorithm that reflects a larger number of similar processes, from data collection through to decision making, which focus on decisions that impact individuals or groups. Specific assurances and safeguards should be described, and the scale and scope of application noted.

During the Social Housing Test Case SIA sought to compare outcomes for people who applied for social housing and were housed, against outcomes for people who applied for social housing but found other accommodation and were not housed. These two groups could be identified in the IDI but were not perfectly comparable (for example: the distribution of household size was different between the two populations).

To provide a more robust conclusion it was necessary to control for these differences between the two populations. Weighting the populations using propensity score matching is a statistical technique intended for this purpose. Several different algorithms, including random forest and gradient boosting were use and evaluated based on the quality of the fit they produced.

During the course of this project several code tools or algorithms were developed by SIA staff (for example: the SIAL and the SIDF, discussed in section 3 below). These tools helped by making the research process replicable, and created a resource that future research could build on.

For further details, please see our technical report, the SIAL and SIDF fact sheets.

2.3 Who designed or created the algorithms described in response to 2.1 and 2.2 (internal staff, external providers?)
It may be helpful to indicate where the agency sought legal advice relating to the design and/or procurement of algorithms.

Internal staff are responsible for the development of SIA's code tools. Some code has been drawn from other organisations where they have data expertise that SIA can benefit from (for example: code to arrange IDI benefit information was sourced from subject matter experts at MSD).

All of the development by SIA staff makes use of external resources, such as R packages. These are either publically available, or part of the software suite.

2.4 Detail any assurance processes, or related safeguards used in conjunction with algorithms described in response to 2.1.
If the agency has a written policy related to automated decision making or the use of algorithms it may be helpful to cite this along with the role of human intervention and discretion. It may also be helpful to describe the nature of the data sets/ sources that are utilised and any records that are maintained so that the operation of the algorithm can be explained including what information is taken into account for the purposes of making any decisions. Examples of assurance should include data management, oversight, or other governance that support responsible use.

SIA does not operate any automated decision making algorithms. All our research code tools must be run manually and the output prepared by technical staff before any results are available to decision makers.

Any algorithms developed internally are peer reviewed; including by external subject matter experts where relevant. Output is compared against other established results, and accompanied by explanation of its derivation.

3. Policy Development and Research

This includes analytical tools used to analyse large and varied data sets to identify patterns and trends and to support policy development or to model potential interventions. The key distinction between these and operational algorithms is that they have no direct or significant impact on individuals or groups. They may inform policy development but have no significant impact on service delivery. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes**.**

3.1 Describe how algorithms are used in policy development and research.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of policy or research that they inform.

Most of the research that SIA undertakes makes use of the IDI. The volume of data in this environment is such that any efficient analysis requires the use of code tools and algorithms.

The algorithms SIA develops and uses include:

- Algorithms for data standardisation, such as the Social Investment Analytical Layer (SIAL). These arrange data in a format that is easy for staff to work with.
- Algorithms for data organisation, such as the Social Investment Data Foundation (SIDF). These combine data from a range of sources into a structure suitable for analysis.
- Algorithms for data analysis as required by staff to produce high quality research. This includes regression models and code snippets that automate repetitive tasks.
- Algorithms for data presentation and visualisation, such as our markdown reports. These take a specially prepared data file and arrange it in a format that is accessible to a less technical audience.

SIA seeks to develop code tools and algorithms as resources that are applicable beyond a single research program. As part of this there is no restriction as to the subject of the research that the tools can be used for. To date, SIA has used the tools to understand social housing, employment and benefit receipt, and regional segments of the population.

By publishing our code, we create opportunities for other organisations to benefit from our work. The SIAL and SIDF tools have already been used by several other organisations for their own research programs.

3.2 If possible, please include an example or examples for illustration.

SIA has produced a prototype report on a regional population using data in the IDI. This report uses a full range of SIA code tools and algorithms:

- The SIAL was used to prepare data from a range of different sources into a consistent format.
- The SIDF was used to combine the data from all the different sources into a single data table.
- Purpose written code was used to analysis and summarise the data down to the regional population.
- A markdown report was used to visualise and arrange the results in a format that could be presented to decision makers.

4. Business rules

These are simple algorithms created by people that use rules to constrain or define a business activity to make determinations about individuals or groups, without a significant element of discretion. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes.

4.1 Describe the role of operational business rules used in decision making.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of decisions that they inform.

Business rules occur in SIA's work primarily as staff defined rules for handling specific IDI datasets or for specific research projects. It is common for these to encode user decisions or definitions. Often these are the result of an investigation into possible ways such a decision or definition could be made, with the preferred version established in code.

Business rules are documented in our research or project reports so that they are subject to scrutiny, and their potential impact can be considered by decision makers.

4.2 If possible, please include an example or examples for illustration.

For example: When considering specific health conditions, business rules were established that describe how we determined, from the available data, the earliest date a person is effected by the condition.

For example: In our social housing research, we established business rules that specified the conditions we had to observe in the data in order to be confident that a person had lived in social housing.

5. Utility and Future Use

5.1 Describe any benefits or expected impact generated through the use of algorithms described in the previous sections.
It may be helpful to draw on the specific examples provided previously to explain how the analysis or service delivery in question was conducted prior to the application of algorithms, and related analytical tools, in order to quantify any efficiencies or improvements that have occurred as a result.

The use of code tools and algorithms is essential to undertaking data heavy research. SIA is able to deliver research findings more efficiently, and with greater transparency, due to our use of algorithms. By building algorithms as resources, we are able to increase the capability of the organisation to produce high quality work.

The benefits of the code tools and algorithms SIA has developed are not limited to just our organisation. These tools are published on GitHub so that others can benefit from our work. It was recently estimated that the SIAL and SIDF have contributed $1 million in savings (news article here) due to savings in staff time from faster data standardisation.

5.2 Describe any challenges or risks your agency is managing as a result of the use of algorithms described in the previous sections, including whether any decisions where algorithms have been used have ever been challenged.
As with 5.1, drawing on specific examples may help illustrate or provide context to this answer. Within this response, it would be useful to provide examples of cases where decisions that involved the use of algorithms were challenged.

Given that the research SIA publishes is heavily dependent on code it is very important to us that our code is of the highest quality. As a result we must be diligent in our approach to quality assurance and peer review. SIA is continuing to refine the process by which algorithms and data outputs are reviewed.

Furthermore, as it is our practice to publish not just research reports but also the accompanying code we encounter several challenges that have traditionally been the domain of software development: version control, producing documentation to accompany code, and ensuring the code is accessible to staff who are not the original authors. Best practice solutions to these challenges already exist and are being incorporated into our processes.

As no algorithm used by SIA makes, or recommends, decisions independently of a staff member it has not been possible for a situation to arise where a decision made by an algorithm was available to be challenged.

5.3 Considering the responses to 5.1 and 5.2 how does your agency assess the on-going utility of algorithms to its current work?

SIA's code tools and algorithms (as described above) are of significant on-going utility in our current work. This utility is derived from:

- Their role as a resource that enhances our capability;
- The extent to which their details document our analytical process;
- Their usefulness across research projects;
- The extent to which they are reusable by, and hence of value to, other organisations.

5.4 Does your agency anticipate that further algorithm development is likely to be important to delivering better outcomes in the future?

Yes. Code tools and algorithms are essential to undertaking data heavy research. While this type of research is not sufficient in isolation to ensure good decision making, it is a powerful tool that will continue to be significant in the future.

The development of new code tools and algorithms will be essential if SIA is to continue to fulfil its objective of making information and insights accessible to decision makers. New algorithms enable the processing of different types and sources of data, and make new types of analysis possible.

5.5 Does your agency expect to develop operational algorithms that rely on AI (artificial intelligence) or machine learning in the future?
SIA does not anticipate developing operational algorithms that use AI or machine learning techniques for our own use in the foreseeable future. Given our data analytics expertise, and our focus on collaboration with other social sector agencies, it is possible that another agency might request our involvement in the building of such tools for their own operational uses.
5.6 Does your agency consider that additional cross-government guidance on the creation and use of algorithms would be helpful?
Any guidance on algorithms would need to consider not just the use of the algorithm, but also the wider purpose it is put to, and the data it depends on. SIA is already developing its own guidance documents to help assess the suitability of data for specific uses. Similar guidance around algorithms would also be valuable.
5.7 Does your agency consider that it would be useful to be able to seek external, independent, expertise in the creation and use of algorithms?
Yes. SIA already seeks external and internal review of our code tools and algorithms as part of ensuring the research and resources we publish are robust and error free. We will continue to do so. However, we also note that finding suitable external expertise is not always straightforward. Cross-government support to identify suitable reviewers is likely to be valuable.

Stats NZ

Agency Name	Statistics New Zealand

1. Data Context

Please provide a high-level overview of how your agency collects, analyses and uses data. This should describe (in general terms) how data supports the work of the agency. This should include information about the types of data that the agency collects and uses (not limited to personal information about individuals). Please indicate whether your agency uses data that is collected and/ or controlled by third parties.

This section should ideally be no longer than three or four paragraphs, written for an audience unfamiliar with the work of your agency.

Statistic New Zealand (Stats NZ) collects a range of data about individuals and organisations from across central and local government, and the private sector. Data is collected through surveys, census, and administration databases. Examples include:

- Household Labour Force Survey
- Environmental reporting through the Ministry for the Environment
- Import and export data via Customs and Immigration
- Travel data via immigration and airlines, and
- Education participation and other data through the Ministry of Education and TEC.

Making use of the wide and growing range of information provided by an increasingly digital world, we can better understand New Zealanders and the way they live.

New technology, new software, and new processes also provide opportunities to make better use of the data already held by government. Combining these with different data sources, such as information in business tax returns, lets us provide more high-quality information more frequently than is provided by survey collection methods. By reusing existing 'administrative' data, this will see a better return on government investment. By reducing the burden on respondents, this will improve citizen experience of government.

2. Operational Algorithms

The main focus of this review is operational algorithms which impact significantly on individuals or groups. These automated processes interpret or evaluate information (often using large or complex data sets) that result in, or materially inform, decisions which impact significantly on individuals or groups. They may use personal information about the individuals or groups concerned but do not need to do so exclusively.

Also, any algorithms that may incorporate AI or Machine Learning fall into this definition. Decisions made by people (e.g. frontline staff) that are informed by such algorithms are in scope, as are automated decisions.

This review seeks to compile as complete and thorough an overview as possible of these types of algorithms.

2.1 Describe the role of operational algorithms used in decision making.

As completely and thoroughly as possible, describe operational algorithms used by your agency. This should include of the scale and scope of algorithm(s) used, and how they affect, or influence, operational decisions within your agency. This may include a count or estimate of the number of algorithms employed and/or a description by category or function.

Stats NZ does not use operational algorithms for case management or interventions which directly impact significantly on individuals or groups. Stats NZ does hold and use personal information about individuals and groups within larger data sets but this is not used in a way where individuals can be identified.

The aspects of Stats NZ operations that involve public engagement are data collection and dissemination.

In the context of data collection, we use algorithms to allocate resources to determining which selected individuals should be a priority for non-response follow up. In the context of dissemination, the main use of business rules is to ensure that data is presented in a way that ensures the identity of data suppliers are not disclosed.

2.2 If possible, please include an example or examples for illustration.
Examples might describe a particular algorithm that reflects a larger number of similar processes, from data collection through to decision making, which focus on decisions that impact individuals or groups. Specific assurances and safeguards should be described, and the scale and scope of application noted.

As an example, in 2018 Census algorithms were developed to predict areas in which respondents were likely to use the internet to provide responses so that the field force could be allocated to where they were needed. As information about response came in other algorithms continuously re-optimised field officer workloads.

2.3 Who designed or created the algorithms described in response to 2.1 and 2.2 (internal staff, external providers?)
It may be helpful to indicate where the agency sought legal advice relating to the design and/or procurement of algorithms.

Algorithms used by Stats NZ are a combination of those developed internally or modified from other statistical agencies. Occasionally algorithms are developed with the assistance of outside partners like Universities.

2.4 Detail any assurance processes, or related safeguards used in conjunction with algorithms described in response to 2.1.
If the agency has a written policy related to automated decision making or the use of algorithms it may be helpful to cite this along with the role of human intervention and discretion. It may also be helpful to describe the nature of the data sets/ sources that are utilised and any records that are maintained so that the operation of the algorithm can be explained including what information is taken into account for the purposes of making any decisions. Examples of assurance should include data management, oversight, or other governance that support responsible use.

As above, Stats NZ algorithms do not impact directly on individuals so there is no need for consideration of the impact of algorithms other than what is undertaken via the process of considering whether there is a need to undertake Privacy Impact Assessments and other aspects of Data Governance.

The nearest to direct impact on the public arises when balances between confidentiality and utility of data have to be struck. Stats NZ does discuss these types of trade-offs with data users and providers.

In terms of the use of algorithms used in Statistical Production work, their accuracy is assured by a range of disciplines used by National Statistics Offices.

3. Policy Development and Research

This includes analytical tools used to analyse large and varied data sets to identify patterns and trends and to support policy development or to model potential interventions. The key distinction between these and operational algorithms is that they have no direct or significant impact on individuals or groups. They may inform policy development but have no significant impact on service delivery. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes**.**

3.1 Describe how algorithms are used in policy development and research.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of policy or research that they inform.

Stats NZ does not oversee any area of public policy that is informed by data analysis. Stats NZ, by contrast, provides the data infrastructure to enable other agencies to undertake research that is an input into the policy development process.

More significantly, Stats NZ uses algorithms to integrate data, as part of its linking methodology. Stats NZ maintains two integrated datasets – the Longitudinal Business Database (LBD) and the Integrated Data Infrastructure (IDI). These link Stats NZ surveys with social and business data from across government and are used for a range of research projects by verified researchers.

Researchers then use their own algorithms – in the form of models and microsimulations – to help sort, arrange, and interrogate the data in the IDI. Algorithms are not used to identify individuals or inform decisions about eligibility of any individuals or groups for any services.

3.2 If possible, please include an example or examples for illustration.

Stats NZ will sometimes partner with IDI researchers, or undertake its own research. Examples of this research include:

- Does volunteering build social trust: evidence from the Census 2013 and GSS 2014
- Better data, better lives: using integrated data to improve outcomes for NEET youth
- Job mobility and wage dynamics, and
- Business participation in government assistance programmes: 2013 update.

4. Business rules

These are simple algorithms created by people that use rules to constrain or define a business activity to make determinations about individuals or groups, without a significant element of discretion. This review seeks input from agencies which provides an illustration of their use of these types of algorithms, but does not seek an exhaustive list of such processes.

4.1 Describe the role of operational business rules used in decision making.
Please provide an indication of the scale and scope of algorithm(s) used and the kinds of decisions that they inform.

Stats NZ uses business rules across the stats process from collection to production to help with consistent management/processing of data. Business rules cover development of questionnaires, collection of data, and management of data, production of statistical estimates and dissemination of statistical outputs.

4.2 If possible, please include an example or examples for illustration.

Implementing confidentiality business rules for Census

Stats NZ has an obligation under legislation, and through our role as a trusted data steward, to protect the privacy and confidentiality of individuals. We do this by applying statistical methodologies that ensure that individuals, households, or businesses are not able to be identified. We have specific methodologies for different types of data, and the rules are reviewed regularly to ensure they stay up to date.

Stats NZ is developing a confidentiality service, which will fully automate the confidentiality rules one system that have historically been managed through a combination of automation and manual processes across systems so that analysts don't need or implement the rules manually.

5. Utility and Future Use

5.1 Describe any benefits or expected impact generated through the use of algorithms described in the previous sections.
It may be helpful to draw on the specific examples provided previously to explain how the analysis or service delivery in question was conducted prior to the application of algorithms, and related analytical tools, in order to quantify any efficiencies or improvements that have occurred as a result.

Stats NZ's use of algorithms ensures that we make efficient use of available information in undertaking statistical production work. Stats NZ does not use algorithms for case management or to identify individual people.

The main benefits from the algorithms used by Stats NZ include increased efficiency, accuracy, and reliability. The algorithms also support further analysis and research by other agencies.

5.2 Describe any challenges or risks your agency is managing as a result of the use of algorithms described in the previous sections, including whether any decisions where algorithms have been used have ever been challenged.
As with 5.1, drawing on specific examples may help illustrate or provide context to this answer. Within this response, it would be useful to provide examples of cases where decisions that involved the use of algorithms were challenged.

Stats NZ regularly reviews algorithms used to support its work. As Stats NZ does not use operational algorithms to inform decisions there have not been any instances where decisions have been challenged.

From time to time individuals do question Stats NZ survey selection methods and how they were selected to participate in surveys. This is more about statistical methodology rather than any consequence of the way algorithms have been used.

5.3 Considering the responses to 5.1 and 5.2 how does your agency assess the ongoing utility of algorithms to its current work?

Algorithms are a key aspect of the work of Stats NZ. As a core part of its data stewardship role Stats NZ regularly reviews its methodologies and algorithms as part of any service changes or system improvements. The growth of the use and importance of data across the public and private sector requires that Stats NZ ensures it can provide effective and efficient data reporting for Government. Stats NZ also has an important role in providing support for government and non-government agencies to undertake research to improve their understanding of what works. Effective algorithms help facilitate data use.

5.4 Does your agency anticipate that further algorithm development is likely to be important to delivering better outcomes in the future?

Stats NZ does not see that operational algorithms that significantly impact on individuals or groups will be important to deliver better outcomes in the future.

However, future development of effective and robust algorithms will support more reliable and timely data production by Stats NZ, and improved data to underpin the work of other organisations.

Improving our linking algorithms will also support more effective and sophisticated research opportunities within our integrated data environments.

5.5 Does your agency expect to develop operational algorithms that rely on AI (artificial intelligence) or machine learning in the future?

Stats NZ does not intend to develop operational algorithms or AI that have significant impact on individuals or groups.

Stats NZ is looking at how AI or machine learning can be used to support customers to better access data and to improve statistical production. Examples include:

Chatbot
An AI supported online search facilitator. Chatbot will facilitate faster, more accurate searches of Stats NZ data sets to identify the most relevant datasets for the customer.

Migration data

Statistics about permanent and long-time migrants are used to inform immigration policy. The classification and identification of such migrants from data on passenger departures data for statistical purposes, is moving from using many business rules to more sophisticated automated algorithms that do not rely on migration cards. The intended algorithm will use data matching and a classification model developed from a machine learning program.
5.6 Does your agency consider that additional cross-government guidance on the creation and use of algorithms would be helpful?
Stats NZ considers that there would be benefit from additional cross government guidance around algorithm development and use.
5.7 Does your agency consider that it would be useful to be able to seek external, independent, expertise in the creation and use of algorithms?
Stats NZ considers that government agencies are likely to benefit from access to external, independent expertise when looking to develop algorithms. Such support might be most beneficial when considering ethical implications of algorithms and ongoing monitoring and evaluation requirements to ensure that algorithms are producing unbiased, fair, and equitable outcomes.