



Strategic Framework for Increasing Vaccine Coverage in Bermuda (2018-2021)

A National Plan to Address Vaccine Hesitancy in Bermuda,
Guided by the World Health Organizations European Regional
Offices' Tailoring Immunization Programs Guide

2019



GOVERNMENT OF BERMUDA
Department of Health

Strategic Framework for Increasing Vaccine Coverage in Bermuda (2018-2021):

A National Plan to Address Vaccine Hesitancy, Guided by the World Health Organizations European Regional Offices' "Tailoring Immunization Programmes" (TIP) Guide.

Mailing Address

P.O. Box HM 1195
Hamilton HM EX
Bermuda

Street Address

25 Church Street
Hamilton HM 12
Bermuda

Phone: (441) 278-4900

Fax: (1441) 292-9125

Email: healthpromotion@gov.bm

Website: www.gov.bm

Published By:

Department of Health (April 2019)

Copyright © Department of Health

Author:

Yosefyah Williams, Public Health Educator with the Health Promotion Office

Reference as:

Department of Health, (2019). Strategic Framework for Increasing Vaccine Coverage in Bermuda (2018-2021): A National Plan for Addressing Vaccine Hesitancy, using the World Health Organizations European Regional Offices' "Tailoring Immunizations Programmes (TIP)" Guide. Ministry of Health, Hamilton, Bermuda.

Table of Contents

Background Information	5
Acknowledgements	6
Abbreviations/Acronyms and Definition	7
Key Words	7
Executive Summary	8
Framing the Issue	9
Introduction.....	9
Vaccine Coverage in Bermuda.....	10
2018 Omnibus Survey.....	10
Addressing the Issue	16
Possible Approaches.....	16
The TIP Guide.....	17
Components of the TIP Guide.....	17
TIP Process.....	18
Rationale for Using the Guide.....	19
Methods	20
How Bermuda is Using TIP.....	20
Diagnostic Stages of the Strategy.....	21
Implementation.....	21
Evaluation.....	21
Results	22
Bermuda Determinants of Vaccine Hesitancy.....	22
Proposed Initiatives/Activities.....	22
Discussion and Future Recommendations	27
Conclusion	28
References	31

Background Information	
Organization Name and Address	Ministry of Health, Department of Health
Project Lead	Yosefyah Williams, Health Promotion
Project Team	Lynn Jackson, Child Health; Dr. Virloy Lewin, Health Promotion; Pauleter Stevens, Health Promotion; Robyn Skinner, Policy Analyst; Isabel Furbert, Child Health; Jennifer Robinson, Child Health; & Tina Evans, Department of Communication.
Project anticipated length	April 2018 - April 2021
Needs Served/importance	Recent research identified the need to address Vaccine Hesitancy among Bermudian residents.
Target Population	Parents/Infants, Adults/Seniors, Healthcare Professionals, and Travelers.

Project Background	Project Goal
Following the 2018 Bermuda Omnibus Survey: A Syndicated Quarterly Survey of the Bermuda Community that focused on vaccine acceptance/hesitancy, the research identified that 1 in 5 residents with children have refused or delayed vaccination. Results therefore, indicate that Bermuda is experiencing Vaccine Hesitancy. In response a team has been commissioned to develop a strategic plan to address vaccine hesitancy and increase vaccine coverage. Using the WHO's TIP (Tailoring Immunization Programmes) guide, a comprehensive strategy was developed.	To increase vaccine coverage by 10% in Bermuda through a comprehensive strategy to addressing country specific 'determinants of vaccine hesitancy' by 2021. This will be in alignment with the Department's vision, mission and core values.

Objectives
<ol style="list-style-type: none"> 1. To foster partnerships with stakeholders, community organizations, and with Department of Health Programs to target 'vaccine hesitancy' in Bermuda. 2. To adapt a multi-pronged approach, including interventions recommended by the SAGE WG and the TIP approach recommended by the WHO the European Regional office to create a 'vaccine hesitancy' strategy. 3. To address 'vaccine hesitancy' on multiple levels including the individual, community and institutional levels.

Department Vision	Department Mission
"Healthy People in Healthy Communities"	"Make Bermuda Healthier"
Department Core Values	Project Specific Core Values
Service	People-Centered (WHO, 2013)
Prevention	Protection of the most vulnerable
Equity	Trust and Transparency (WHO, 2013)
Accountability	Diversity (WHO, 2013)
Knowledge	Participatory (WHO, 2013)
Collaboration	Solidarity
Quality	

Acknowledgements

The Strategic Framework for Increasing Vaccine Coverage in Bermuda was written, informed and reviewed by the following individuals:

Lead author (s)

Yosefiah Williams, Public Health Educator.

Technical Reviewers

Dr. Jennifer Attride-Stirling, Ministry of Health Permanent Secretary; David Kendell, Department of Health Director; Laura Lynn Jackson, Child Health Coordinator; Dr. Virloy Lewin, Health Promotion Coordinator; Robyn Skinner, Policy Analyst; Jennifer Robinson, Health Visitor; Isabel Furbert, Health Visitor; Erinn Smith, Health Visitor; and Dr. Attiya Talbot, Child Health Medical Officer.

Bermuda's Working Group on Vaccine Hesitancy

The Bermuda Department of Health would like to acknowledge the members of Bermuda's Working Group (WG) on Vaccine Hesitancy. Thank you to, Dr. Eugene Outerbridge, Dr. Amani Flood, Dr. Kristen Woodward, and Dr. Sylvanus Nawab, for their partnership, collaboration, diligence and contribution as Bermuda's Working Group on Vaccine Hesitancy. Thank you to the Child Health Department, the Health Promotion Office, and the Department of Communication and Information for their support in the development of the strategy.

Stakeholders Who Informed the Strategy

The Department of Health would like to acknowledge Somerset Primary's 2019-2020 Executive PTA, Whitney Institute's 2018-2019 Executive PTA, and Cedarbridge Academy's 2019-2020 Executive PTA, for their contribution as proactive, diligent key informing stakeholders for the strategy on vaccine hesitancy.

Abbreviations/Acronyms

Bermuda	BDA
Capability Motivation Opportunity-Behavior	COM-B
Diphtheria-Pertussis-Tetanus	DPT
Department of Health	DoH
European Technical Advisory Group of Experts	ETAGE
Expanded Program on Immunization	EPI
Global Vaccine Action Plan	GVAP
Pan American Health Organization	PAHO
Strategic Advisory Group of Experts on Immunization	SAGE
Tailoring Immunization Programmes Guide	TIP Guide
Vaccine Hesitancy	VH
Vaccine Preventable Disease	VPD
Working Group	WG
World Health Organization	WHO

Definition

Vaccine Hesitancy: is defined as “delay in acceptance of or refusal of vaccination despite availability of vaccination services. Vaccine hesitancy is a complex health concern and will require more than a single solution; it will require a comprehensive approach” (MacDonald, & the SAGE Working Group on Vaccine Hesitancy, 2015).

Keywords

- Vaccine Hesitancy
- Vaccine Coverage
- Behavior Change
- Determinants of Vaccine Hesitancy
- Tailoring Immunization Programs (TIP)

Executive Summary

Background: In 2017 Bermuda experienced low vaccination coverage for children at six months of age. Bermuda's vaccination coverage is assessed through reporting of vaccines given in the public and private sector. Data is submitted to the Department of Health routinely from private physicians. As a result the Child Health Program commissioned further investigation into the issue, through a Bermuda Omnibus survey in 2018. The aim of the survey was to identify if Bermuda is facing vaccine hesitancy. The survey further confirmed that Bermuda's vaccine coverage is suboptimal and that Bermuda is experiencing vaccine hesitancy ⁽¹⁾. As a result of this concern Department of Health has commissioned a strategy to address vaccine hesitancy. Preliminary research identified that vaccine hesitancy is a growing health concern worldwide ^{(2) (3) (4) (5) (6)}, further prompting the research of possible approaches to address it.

Methods: The literature revealed that vaccine hesitancy requires a rounded approach ⁽⁵⁾, further leading to the conclusion that the World Health Organization European Regional Office's Tailoring Immunization Programmes Guide is the best approach. Evaluation of TIP indicates that it is a useful tool, but cautions not to get stuck in the diagnostic stages ^{(7) (8)}. Evaluation of vaccine hesitancy in a country specific context, is based on the diagnostic stages ^{(7) (8)}. Following investigation of the issue and identifying TIP as an ideal approach for the strategy, preliminary recommendations for developing the strategy were made.

Findings: Recommendations led to proposed interventions based on the results of the diagnostic stages of TIP. Some of the proposed interventions include, community vaccine information sessions, innovative vaccine record keeping tools, and practitioner communication tools. Further recommendation suggests that Bermuda should investigate immunization services for necessary system changes.

Interpretation: The purpose of the strategy is to implement innovative interventions that will contribute to increased vaccination coverage, and indicate the choice to vaccinate as a positive health action. Raising awareness of VH, and fostering community participation in Bermuda's immunization program will be integral and will require funding.

Conclusion: The goal of Bermuda's strategy on vaccine hesitancy is to increase vaccine coverage by 10% in Bermuda. This will be done through a comprehensive strategy addressing country specific 'determinants of vaccine hesitancy' by the year 2021, with an aim to do so in alignment with the department's vision, mission and core values.

Introduction

The introduction of vaccination along with other hygiene practices, is one of the most effective public health interventions known to medicine today, and has increased life expectancy worldwide since 1970 - 2010 from 58.5 years to 70 years ^{(9) (10) (11)}. In Bermuda specifically, the incidence of Chickenpox between 2006 and 2015 decreased from 248 cases to 28 cases ⁽¹²⁾. The evidence indicates that vaccination is beneficial to society, and speaks through occurrences like the global eradication of smallpox in 1980 ⁽¹⁰⁾. Smallpox, which once claimed the lives of over half of those affected and seriously maimed those who survived ⁽¹⁰⁾. Despite the evidence of its effectiveness, a phenomenon known as Vaccine Hesitancy (VH), threatens the health of communities worldwide ^{(2) (3) (4) (5) (6)}. Vaccine Hesitancy is defined as the “delay in acceptance of or refusal of vaccination despite availability of vaccination services” ⁽⁵⁾. The World Health Organization recommends 95% coverage in all vaccinations to protect both those vaccinated and unvaccinated ^{(5) (11)}.

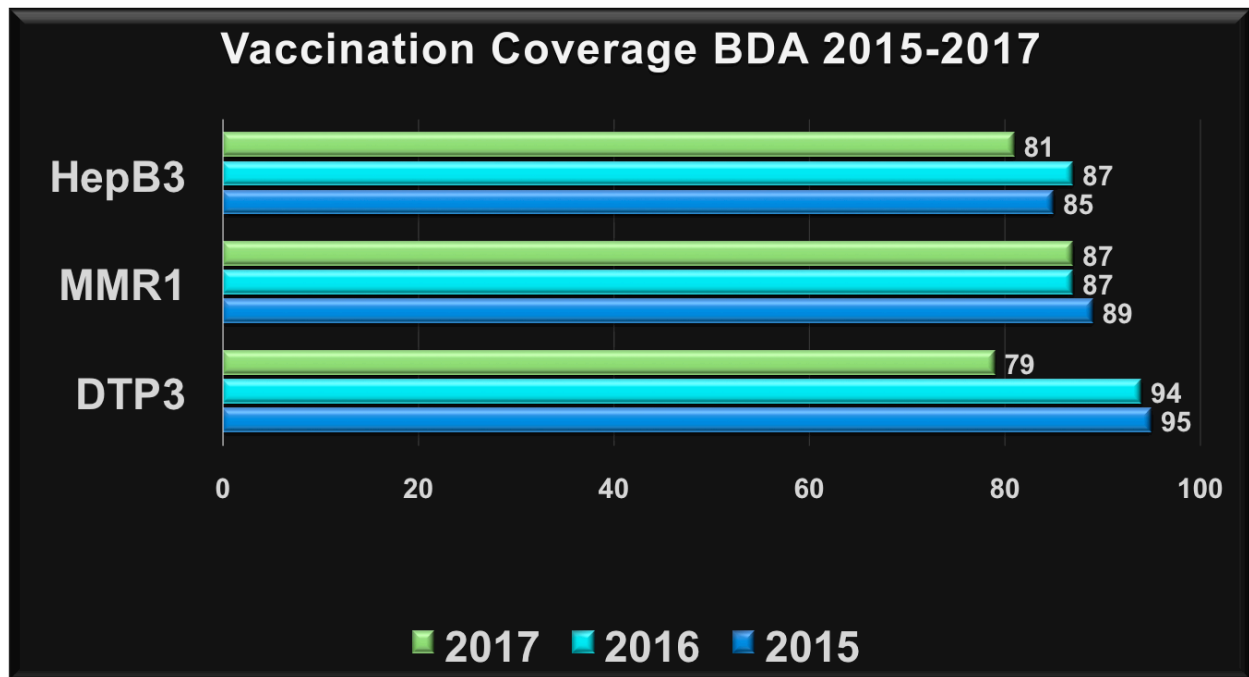
According to the Pan American Health Organization’s (PAHO) 2017 Expanded Program on Immunization (EPI) Country Report for Bermuda, vaccine coverage in Bermuda decreased from 94% in 2016 to 79% in 2017 ⁽¹³⁾ (Figure. 1). The declining vaccination coverage in 2017 heightened the concern within Bermuda’s Department of Health (DoH), prompting further investigation of Bermuda’s vaccine coverage. A survey was commissioned by the DoH in April 2018 which, subsequently identified that 1 in 5 Bermuda residents with children have either refused or delayed vaccination ⁽¹⁾. The survey further supports PAHO’s 2017 EPI report that Bermuda’s vaccine coverage is suboptimal dropping by almost 20% in one year ^{(1) (13)}. Bermuda’s Department of Health recognizes the grave implication of diminished herd immunity and is therefore actively working to reduce VH in Bermuda. In doing so, the development of a strategy addressing VH is necessary.

The Framework on VH will serve as a guide for interventions/initiatives aimed at addressing VH. The aim is to use the World Health Organizations European Regional Offices’ Tailoring Immunization Programs Guide. The rationale will provide reasoning for using the TIP guide in lieu of other interventions alone. The framework will also, indicate how the TIP guide will be used in a Bermuda specific context, what the components are of Bermuda’s strategy on vaccine hesitancy, and how the strategy will be evaluated. Ultimately, the strategy target is to increase vaccine coverage in Bermuda by 10% by the year 2021. Recognizing this as a potential public health threat, it is important that Bermuda takes steps towards achieving the ideal rate for vaccination coverage on all levels.

Vaccine Coverage in Bermuda

The 2017 PAHO EPI vaccine coverage country report indicates that Bermuda is at 79% vaccine coverage in comparison to 94% the previous year ⁽¹³⁾. In response a quarterly survey commissioned by Bermuda's DoH was conducted in April 2018. The survey consisted of telephone interviews of 400 Bermuda residents ⁽¹⁾. The survey revealed that currently, Bermuda is at 80% vaccine coverage ⁽¹⁾. In accordance with the WHO's recommendation of 95% immunization coverage to insure herd immunity, Bermuda is at suboptimal levels ⁽¹¹⁾. The survey sought to answer the questions below in reference to childhood vaccines ⁽¹⁾.

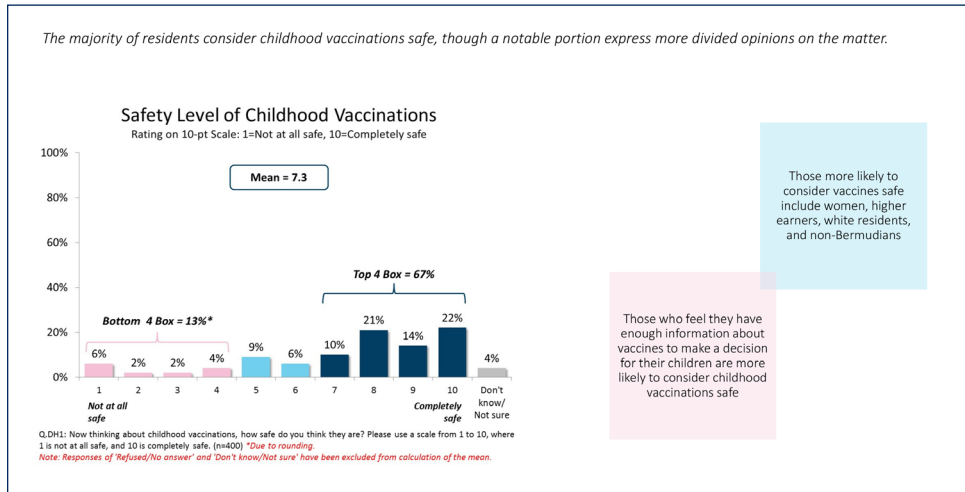
Figure 1.



2018 Omnibus Survey Responses

Perceived Safety of Childhood Vaccination

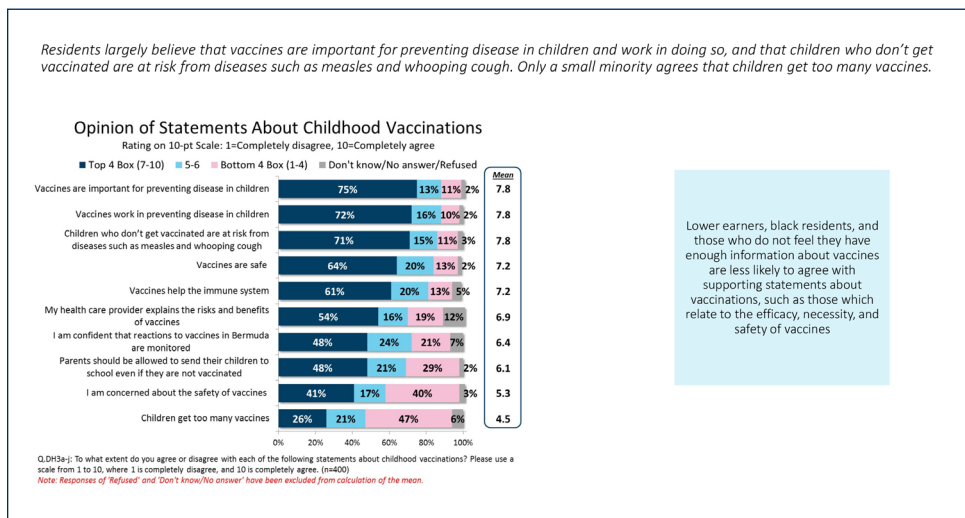
Figure 2.



Participants were asked to indicate how safe they thought childhood vaccination is on a scale of 1-10, with 1 indicating that they are not at all safe and 10 indicating that vaccines are completely safe ⁽¹⁾. Responses to that question indicated that 22% of

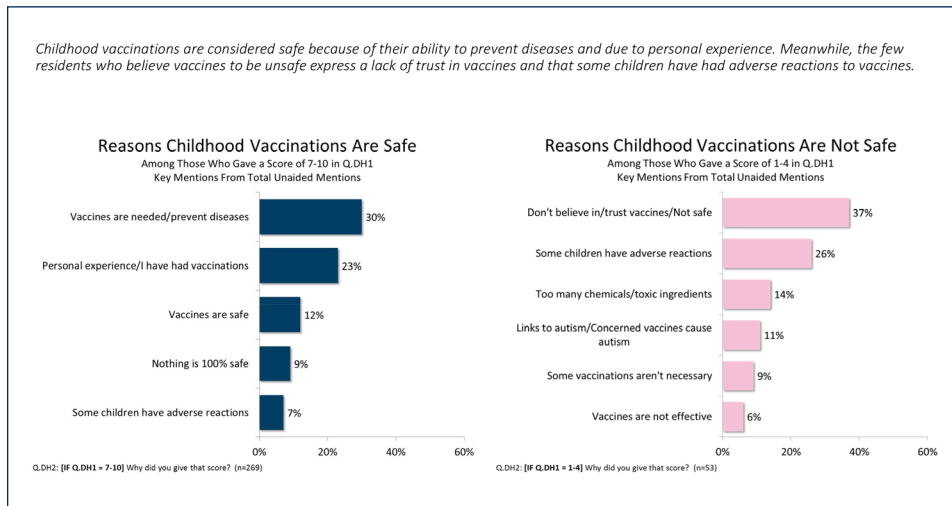
participants found childhood vaccination to be “completely safe”, and 6% indicated that childhood vaccination is “not safe at all” (Figure. 2) ⁽¹⁾.

Figure 3.



The top 2 reasons people perceived childhood vaccinations as unsafe were because they “don’t believe in/trust vaccines/not safe” at 37%, and some children have adverse reactions at 26% (Figure. 3) ⁽¹⁾.

Figure 4.

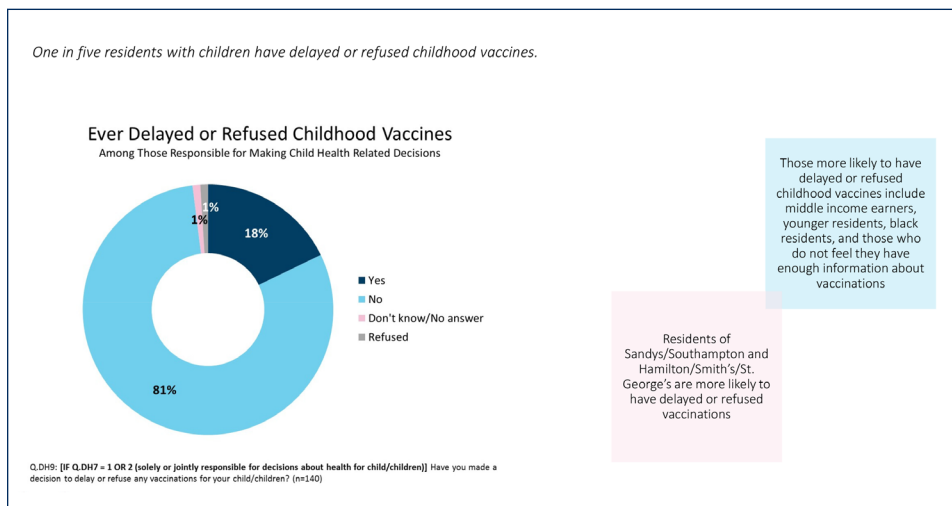


Participants were then asked to rate their agreement with several statements on a scale of 1-10 where 1 is completely disagree and 10 is completely agree (Figure 4.)⁽¹⁾. One statement being, “vaccines are important for preventing disease

in children”, which resulted in 75% of respondents indicating 7-10 on the scale, 13% indicating 5-6 on the scale and 11% indicated 1-4 on the scale⁽¹⁾. Another statement being, “children get too many vaccines”, indicated that 26% of respondents agreed to 7-10 on the scale, 21% indicating 5-6, and 47% indicating 1-4 on the scale⁽¹⁾.

Delay or Refusal of Childhood Vaccines

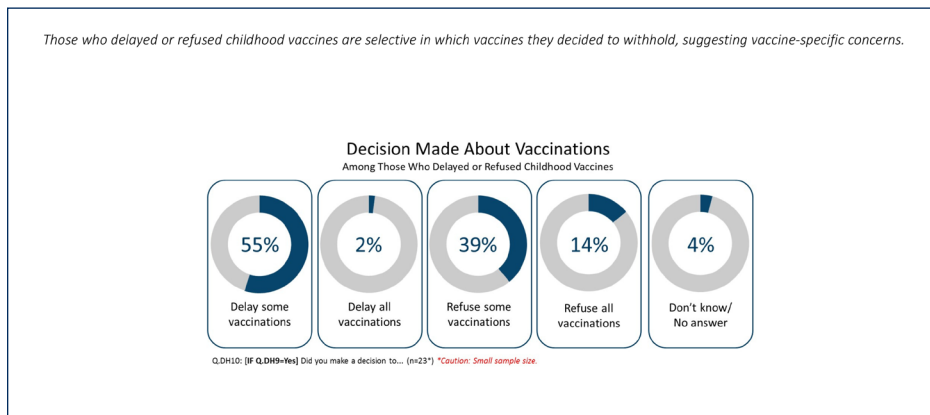
Figure 5.



Survey participants were asked if they had children under 18, under 6 and/or if they or their partner were expecting a child in their household⁽¹⁾. If answered yes, participants were then asked if they were solely responsible for decision making in the household,

jointly responsible, or someone else is responsible⁽¹⁾. Those respondents who answered yes to the previous questions were then asked, “Have you made a decision to delay or refuse any vaccinations for your child/children”⁽¹⁾. Responses indicated that 81% did not refuse or delay vaccinations, while 18% have either refused or delayed vaccination (Figure. 5)⁽¹⁾.

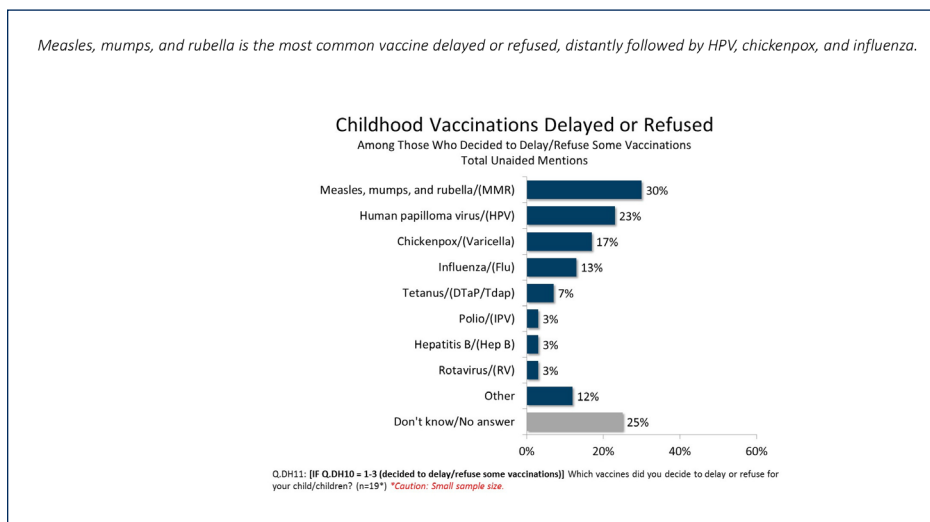
Figure 6.



Respondents were then asked, to what degree they had delayed or refused vaccines ⁽¹⁾. Results indicated that 55% of those respondents delay some vaccinations, 2% delay all vaccination, and 39% refuse some vaccinations, while

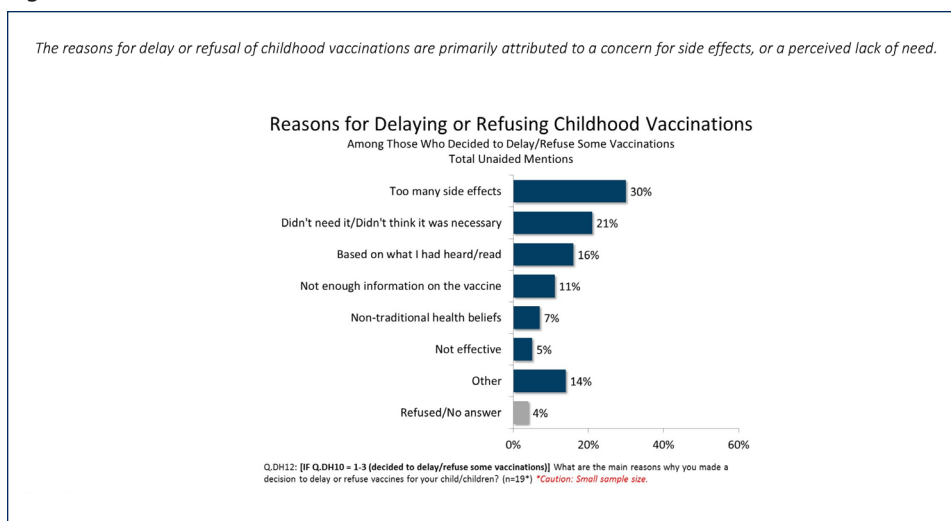
14% refuse all vaccinations (Figure. 6) ⁽¹⁾.

Figure 7.



The survey also revealed that the MMR (Measles, Mumps, and Rubella) vaccine at 30% is the most refused or delayed childhood vaccine, and HPV (Human Papilloma Virus) the second most delayed or refused childhood vaccine (Figure. 7) ⁽¹⁾.

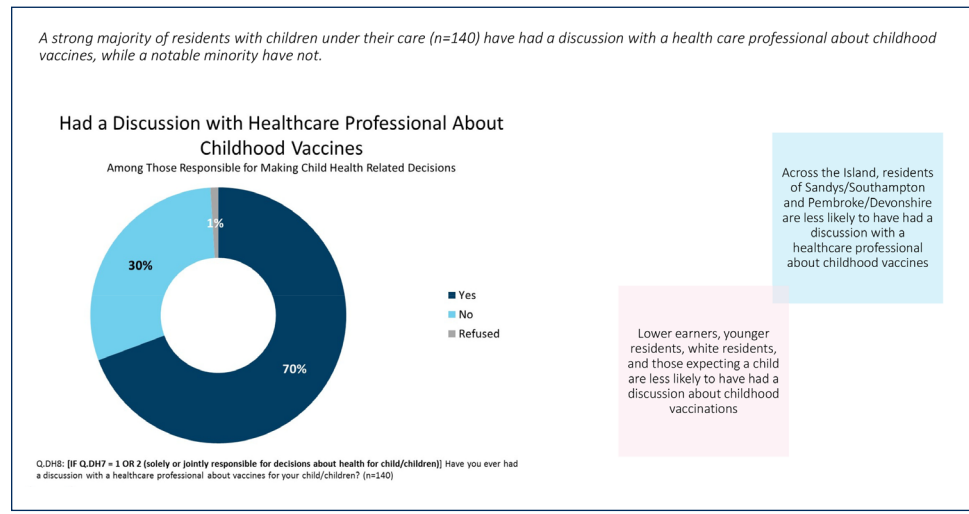
Figure 8.



Participants were asked reasons for delaying or refusing vaccines (Figure. 8), and the top three responses were, “too many side effects” at 30%, “didn’t need it/didn’t think it was necessary” at 21%, and “based on what I heard/read” at 16% ⁽¹⁾.

Source of Information about Vaccination

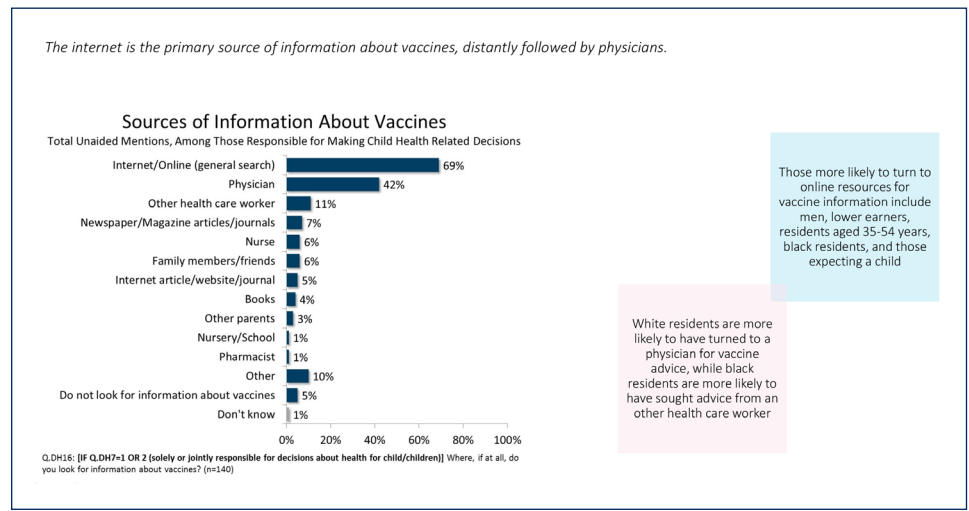
Figure 9.



The survey also explored whether participants have had a discussion with a healthcare professional regarding vaccination, which then indicated that 70% had a discussion with a healthcare professional and 30% had not

(Figure. 9) (1).

Figure 10.



Participants were asked what their main sources of information was and the top three responses were, internet/online (general search) at 69%, Physician at 42%, and other healthcare workers at 11% (Figure. 10) (1).

Addressing Vaccine Hesitancy

A review of the literature on VH suggest that dialogue-based and multi-component interventions are the most effective ⁽⁴⁾. However, the research also emphasizes the complexity of vaccine hesitancy further indicating that more tailored solutions are required ⁽⁴⁾. According to MacDonald, & the Strategic Advisory Group of Experts (SAGE) Working Group on Vaccine Hesitancy, “Vaccine hesitancy is a complex health concern and will require more than a single solution; it will require a comprehensive approach” ⁽⁵⁾. The literature also asserts that any approach taken to reduce vaccine hesitancy and/or increase vaccine uptake should use a multi-level and multi-pronged strategic approach ⁽²⁾⁽³⁾⁽⁴⁾⁽⁵⁾⁽¹⁴⁾. A commissioned systematic review of vaccine hesitancy interventions by SAGE Working Group on Vaccine Hesitancy revealed three intervention themes including dialogue-based, incentive-based and reminder/recall-based ⁽⁴⁾. Another approach developed by the World Health Organization’s European Regional Office, is the TIP guide (Tailoring Immunization Programmes) ⁽¹¹⁾.

Dialog based intervention

Dialogue-based interventions are characterized as interventions using religious leaders, community leaders, social media, mass media, and communication tools for Health Care Workers, and social mobilization ⁽⁴⁾. The literature advocates for communication as it is an integral component that should be included in any vaccination program, and a component that can enhance or hinder a program dependent on how it is used ⁽¹⁴⁾. Research also indicates that social marketing is an effective communications approach used to encourage health behavior change and is believed to be effective in conjunction with other components addressing ‘Vaccine Hesitancy’ ⁽¹⁵⁾.

Incentive-based and reminder-recall intervention

Incentive-based (non-financial) interventions are characterized as interventions that provide incentives that address basics needs; for instance providing food to food insecure populations ⁽⁴⁾. One could interpret that by addressing a basic survival need such as access to food, it lessens immediate concern, providing opportunity to address other needs such as vaccination ⁽⁴⁾. Reminder/recall-based interventions are characterized as interventions that include calling or letter writing to the target population, but is believed to be less effective if implemented alone ⁽⁴⁾.

Tailoring Immunization Programmes (TIP) Guide

The TIP guide is designed to be an evidence-based, people-centered approach for sustainable vaccination behavior change ⁽¹¹⁾. It is however emphasized, that TIP is neither a “one size fits all” approach nor a communications-based intervention ⁽¹¹⁾. TIP does however, provide the opportunity to tailor interventions to the target population and is a useful guide for promoting behavior change through intervention ⁽¹¹⁾. In addition, TIP strives to address system level concerns that may be facilitating vaccine hesitancy ⁽¹¹⁾. The TIP process requires several steps such as: engage, analyze and prioritize, research and design, Implement and monitor, and evaluate and document ⁽¹¹⁾. Ultimately, one could interpret from the literature that strategies to address Vaccine Hesitancy should be population specific, comprehensive, and evaluated ⁽⁴⁾⁽¹¹⁾.

The TIP Guide

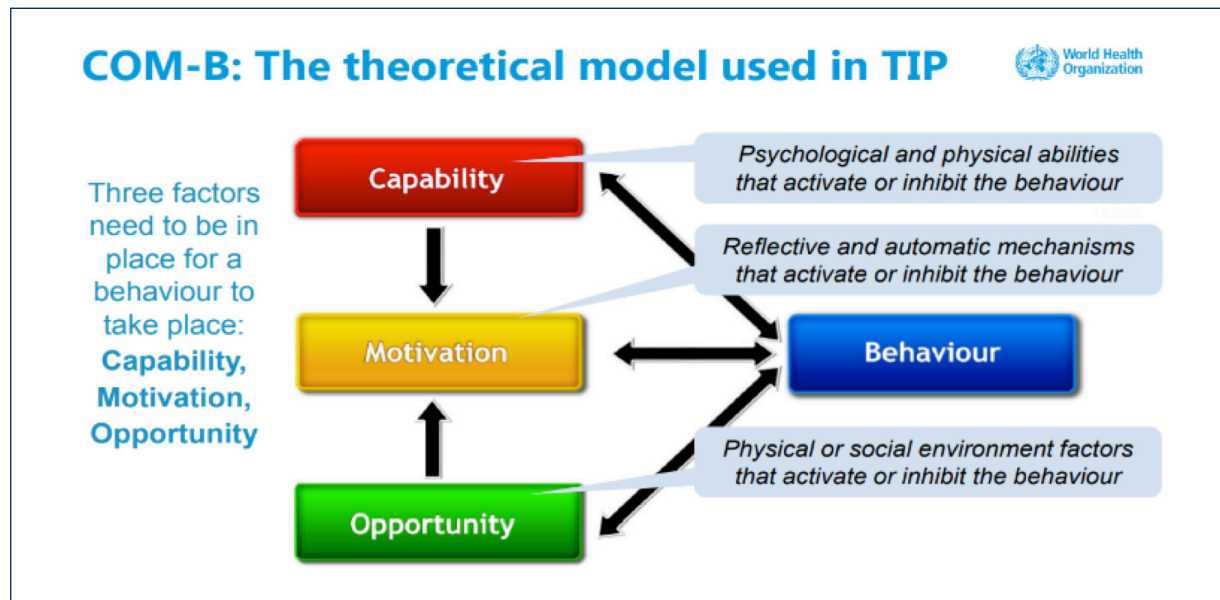
Vaccine hesitancy is a growing worldwide public health concern, and European regional countries are not exempt ⁽¹¹⁾. It is an issue being recognized by public health organizations worldwide prompting research and tools to tackle the issue ^{(2) (3) (4) (5)}. Low vaccination coverage and reemergence of VPD such as measles defines VH according to MacDonald, and the SAGE WG on Vaccine Hesitancy ⁽¹¹⁾. As a result of this growing concern, the WHO has emphasized the need to set attention to developing innovative strategies that will address VH and to help maintain immunization programs ⁽¹¹⁾.

In 2013, the World Health Organization European Regional office, in alignment with the Global Vaccine Action Plan (GVAP) (2011-2020), recommendations from the European Technical Advisory Group of Experts (ETAGE) on Immunization, and recommendations from the Strategic Advisory Group of Experts (SAGE) on immunization, developed the Tailoring Immunization Programmes guide (TIP) ⁽¹¹⁾⁽¹⁶⁾. SAGE's review of GVAP, recommended each country develops a strategy that will enable increased acceptance and demand of vaccination ^{(16) (17)}. TIP was designed for European countries to execute the GVAP objectives 2 and 3 ⁽¹¹⁾. The GVAP is a product of the 64th World Health Assembly, resulting in endorsement of it during the 65th World Health Assembly in 2012 ⁽¹⁸⁾. Six principal objectives guided the development of the GVAP, which included, 1) country ownership, 2) shared responsibility and partnership, 3) equity, 4) integration, 5) sustainability, and 6) innovation ⁽¹⁸⁾. Ultimately, the development of the TIP guide is the result of culminating factors inclusive of diminishing herd immunity worldwide, increased vaccine hesitancy, alignment with GVAP (2011-2020) objectives and strengthening immunization programmes ^{(11) (16) (18)}.

Components of TIP

Before implementing TIP, it is important to know if TIP is right for Bermuda. The WHO European Regional Office used a check list to identify the need to use TIP. The check list includes, the desire to increase vaccination coverage, low coverage, political will and support, funding, etc. ⁽¹⁵⁾. Bermuda meets all of the components of the list. Components of the TIP guide provides the opportunity to explore VH on multiple levels including environmental and institutional factors, social and supportive factors, personal and motivational factors, and health worker encounter ⁽¹⁶⁾. The aim of TIP is to provide a platform for a strategy that is evidence-informed and places the choice to vaccinate as a positive action ⁽¹¹⁾. Ultimately, "the objective of the Guide is to offer proven methods and tools to design targeted strategies that increase uptake of infant and child vaccination" ⁽¹¹⁾. The TIP guide provides the ability to identify and prioritize susceptible populations, diagnose the demand-and supply-side barriers to vaccination, and design evidence-informed responses ⁽¹¹⁾. TIP is supported by health behavior theory, which in this case uses the Capability, Opportunity, Motivation, Behavior (COM-B) theoretical model (Figure. 11) ⁽¹⁶⁾. It is indicated that these three factors are required for a behavior to take place ⁽¹⁶⁾. TIP also takes into account social determinants of health (SDoH), which are defined as underlying factors that help to shape health outcome, such as environment, where you work, where you live, and how you grow up ⁽¹¹⁾. Social determinants of health are important to the TIP guide in that understanding those specific factors that facilitate the decision to or not to vaccinate ⁽¹¹⁾.

Figure. 11 COM-B Theoretical Model (13)



Process of TIP

The process of TIP requires several steps including: engage, analyze and prioritize, research and design, implement and monitor, and evaluate and document ⁽¹⁶⁾.

- **Engage**

The first component of the process, engage, entails process planning, and the launch of TIP ⁽¹⁶⁾. Carrying out process planning is inclusive of gathering background information, exploring initial planning, developing a budget, time-lines, and identifying roles and responsibilities ⁽¹⁶⁾. Launching TIP is inclusive of briefing and building capacity, gathering initial information and data, engaging key stakeholders, and establishing an initial assessment of TIP priorities ⁽¹⁶⁾.

- **Analyze and Prioritize**

The next step is analyzing and prioritizing which includes, developing a situational analysis, and engaging stakeholders ⁽¹⁶⁾. Developing a situational analysis includes, review of our immunization program, and review of available studies (ex. Access and use of services, knowledge, attitudes etc.) ⁽¹⁶⁾. Engaging stakeholders includes, exploring collective knowledge, identifying gaps in knowledge, identifying the target populations, identifying behavior barriers, and agreeing on a focus for the research ⁽¹⁶⁾.

- **Research and Design**

The third step in the process, research and design includes conducting the research, and translating the research findings into an intervention ⁽¹⁶⁾. Conducting the research is inclusive of developing the research protocol, and implementing the research ⁽¹⁶⁾. Translating the research into an intervention requires the convening of stakeholders, identifying target behavior, designing and planning the intervention, and lastly developing an evaluation plan ⁽¹⁶⁾.

- **Implement and Monitor**

Step four is implementation and monitoring, which includes implementing planned activities ⁽¹⁶⁾. This step is inclusive of continuous data and information collection and making interactive adjustments where required ⁽¹⁶⁾. The last step in the process is evaluation and monitoring, which includes evaluating the outcomes and impacts and documenting ⁽¹⁶⁾. Evaluating outcomes requires engaging stakeholders to review findings, and assessing the need for adjustment of the intervention ⁽¹⁶⁾.

Rationale for Using TIP

Rationale for using TIP as a guide for Bermuda's strategy on VH is based on a number of considerations. These considerations include TIP's adaptability, ability to tailor initiatives to target groups, its aim to meet GVAP (2011-2020) objectives, and its sustainability through evaluation ^{(11) (16) (19)}. TIP to date has been implemented in Bulgaria, Sweden, Lithuania and the United Kingdom ^{(7) (8) (19)}. Evaluation of TIP indicates that it is a valuable tool for diagnosing the state of vaccine hesitancy, but country specific adaptation is required ⁽¹⁹⁾. It is also emphasized that application of TIP can help inform decision-makers of what factors influence the choice to vaccinate, which may better inform how decision-makers address VH ⁽¹⁹⁾.

It is further indicated that application of TIP provides a platform that can help to shift away from traditional costly interventions, by developing targeted interventions ⁽¹⁹⁾. This is especially important during times of fiscal constraint ⁽¹⁹⁾. Further evaluation of TIP frames it as having the ability to add value to national immunization programs ⁽⁷⁾. TIP's tailored nature places value in understanding the reasons that lead to under-vaccination and unlike many other approaches is inclusive and participatory ⁽⁷⁾.

TIP's people-centered and community involvement components are critical; having community engagement at the heart of it leads to building in-depth understanding and trust ^{(7) (8)}. Review of TIP does however, caution that implementation of intervention is complex (e.g. System changes) and challenging ^{(7) (8)}. This was evident through the evaluation of TIP in each of the countries implemented, resulting in one of the countries not making it to intervention and the others only making it to the first stage ⁽⁷⁾.

Recommendation therefore indicates that the TIP processes should begin with the ultimate goal of increasing vaccination coverage ⁽⁷⁾. Furthermore, recommendation cautions not to prolong the diagnostic component of TIP, hence placing more focus on arriving to implementation of achievable interventions ⁽⁷⁾. TIP is not a cure-all approach to VH, but undeniably has the potential to lead to effective solutions benefiting individuals, families and overall society ⁽¹⁹⁾.

Methods

Engage	Analyse and Prioritise	Research and Design	Implement and monitor	Evaluate and Document
<p>This was done in several ways, beginning by developing a team on Vaccine Hesitancy (DoH's team on VH)</p>	<p>Engagement prompted the recommendation that BDA uses the WHO/EUR TIP guide.</p>	<p>For this component data was already existent through the 2017 EPI report and subsequently the 2018 omnibus survey. Data was reviewed and revealed target groups and determinant of VH.</p>	<p>A schedule has been developed with the roll out of proposed initiatives/activities, which are informed by the Determinants of VH identified. For example, offering "let's talk vaccination sessions to the public to address the Education determinant of VH.</p>	<p>In 2021 DoH will re-evaluate the state of vaccination in Bermuda. Continued Stakeholder engagement will inform determinants of hesitancy.</p>
<p>A project lead was assigned & background information was gathered on the state of Bermuda's vaccination coverage.</p>	<p>It was recommended that a working group be developed to further assess the state of VH in BDA.</p>	<p>Four main target groups were identified through the survey (Parents/ infants, Adults/ Seniors, Travelers & Healthcare professionals). Four main barriers/ determinants of VH were identified through the survey (Trust, Effectiveness, Service Delivery & Education).</p>	<p>Each intervention aims to increase overall vaccine coverage in Bermuda. They also seek to address systemic related determinants of VH, further identified through community engagement.</p>	<p>An evaluation plan is to be developed for the over all strategy as well as each individual intervention/activity</p>
<p>Lastly research was conducted to identify approaches, from which recommendations were made. recommendations were made.</p>	<p>Another recommendation was to engage with community stakeholders; through school Executive PTAs, which would provide further insight on determinants of vaccine hesitancy, and foster community participation.</p>	<p>Which further supported Bermuda's 2017 EPI report, that Bermuda's vaccine coverage is suboptimal.</p> <p>Bermuda WG on VH, was then convened, and engagement with school PTAs occurred, to review findings and identify determinants of VH behavior change</p>	<p>Following evaluation data will be reviewed, and adjustments made.</p>	<p>The aim is to develop interventions and evaluate for sustainability.</p>

Diagnostic stages/Preliminary Stages:

During the diagnostic stage of the strategy; data collection, needs assessment and the state of vaccination in Bermuda was assessed. This consisted of preliminary research on the state of VH worldwide, which was to explore existing evidence and lessons learned. Then research on VH in Bermuda was conducted, which included analysis of the 2018 Omnibus survey, convening of Bermuda's Working Group on Vaccine Hesitancy, and discussion sessions with executive PTA committees from a primary, middle, and senior school. Bermuda determinants of vaccine hesitancy were identified. Subsequently, recommendations for developing the strategy and addressing vaccine hesitancy in Bermuda were made.

Implementation/Next Steps:

Following the preliminary stages of the strategy further recommendations were made in reference to the proposed interventions. The aim of the recommended interventions is to begin addressing some of the Bermuda determinants of VH identified through the diagnostic phase. It is recognized that this is a complex issue and therefore, it is necessary to continue exploration of the state of vaccination in Bermuda. Although further research is required, implementation is necessary to avoid stagnation in the diagnostic stage. Evaluation of TIP cautions that remaining in the diagnostic stage of TIP is a limitation and may put a strain on resources ⁽⁷⁾⁽⁸⁾.

Evaluation:

Discourse emphasizes that evaluation is an important component of program development and implementation ⁽²⁰⁾⁽²¹⁾. According to Frieden, there are six major components required to implement effective public health programs some of which include, effective performance management through real-time monitoring, evaluation and program improvement ⁽²¹⁾. Frieden also emphasizes that programs like smallpox eradication and others have made progress by using these six components ⁽²¹⁾. It is also emphasized that program planning and evaluation have a cyclical relationship, suggesting that there is a need to evaluate throughout the process, at the end and continuously for reinforcement and sustainability ⁽²⁰⁾. It is important that evaluation of programs explore a culmination of factors including what works well, why it works, whether improvement is required, and if the program has made a difference ⁽²⁰⁾. This process is especially necessary for health promotion due to its complexity ⁽²⁰⁾. It is therefore, necessary to explore multiple forms of evaluation including, formative evaluation, process evaluation, impact evaluation, and outcome evaluation ⁽²⁰⁾. In accordance with discourse, the strategy will aim to use several forms of evaluation, as the strategy includes different types of interventions varying by settings, target groups, and implementation methods. Therefore, each intervention will have an evaluation plan compatible with its setting and form of implementation. It is important to highlight that the strategy is evaluated throughout the process to assess quality of service delivery and at the end to assess impact. Furthermore, the strategy in its entirety will be evaluated using an indicator of increased vaccine coverage by 10% by 2021.

Results

Results of the diagnostic phase of TIP revealed that Bermuda’s vaccination coverage is below 80% ⁽¹⁾⁽¹³⁾. The diagnostic phase also revealed several determinants of vaccine hesitancy through stakeholder discussion and review of data from the 2018 Omnibus survey. These determinants include, trust, education, service delivery, effectiveness of vaccines and legislation/policy. In addition, four major target groups were identified including parents/infants, adults/seniors, travelers, and healthcare professionals. As a result of identifying the major target groups and determinants of vaccine hesitancy, recommendation of possible interventions/initiatives have been made (Figure 12-18). Future recommendations for continued implementation of Bermuda’s Strategy on vaccine hesitancy have also been made (Figure. 19).

Proposed Initiatives/Activities

Figure. 12

BDA Working Group on Vaccine Hesitancy	
Goal	To contribute to the Vaccine Hesitancy Strategy with input based on experience, and to support initiatives developed as a result of the strategy.
Objective(s)	<ul style="list-style-type: none"> • To contribute to the vaccine hesitancy strategy through collaborative working group meetings. • To adopt and promote any material related to immunization in their practices, on social media, and through platforms they may have access to generally. • To Review and/or provide feedback in reference to materials relating to immunization. • To take a unified stance on Vaccination as valued stakeholders. • To participate in immunization week (April 2019) initiatives, facilitated by the Department of Health, where possible.
Initiative Background	To ensure the strategy is comprehensive, inclusive and considers diversity of cultural beliefs and practices. The Department of Health’s team on vaccine hesitancy sought input from key stakeholders. The purpose of Bermuda’s Working Group on Vaccine Hesitancy is to provide professional and personal experience, and to advise on possible steps forward.

<p>Methods</p>	<ul style="list-style-type: none"> • A call to action was put to private sector including, general practitioners, pediatricians, and naturopathic practitioners. • Three Working Group Discussions session were held between December 2018 and February 2019. • Lastly, information collected from all sessions was compiled and recommendations were made based on the results. <p>Future recommendation: is that the working group becomes an ad hoc working group to further develop partnership and strengthen the national approach to the vaccine hesitancy strategy.</p>
<p>Measures of Success</p>	<p>Indicators of success:</p> <ul style="list-style-type: none"> • Adaptation of protocol/policies to reduce VH in practices • Solutions are identified through WG meetings • Advocacy for vaccination in the public occurs

Figure. 13

Let's Talk Vaccination PTA and Public discussions	
Goal	To offer discussion/information sessions to the public (nurseries, rest homes, private companies, etc.) on vaccination with the aim to raise awareness and empower stakeholders with the information to make informed decisions about vaccination; while also fostering community participation.
Objective(s)	<ul style="list-style-type: none"> • To offer information sessions on vaccination to the public by request. • To foster community engagement and advocacy • To gather further information on determinants of vaccine hesitancy
Initiative Background	The purpose of the "Let's Talk Vaccination" community discussion sessions, is to facilitate community participation in initiative reform, to provide access to information on vaccines, and to foster advocacy for Bermuda's immunization program.
Methods	Let's Talk Vaccination sessions Will be offered to different agencies, and more specifically agencies that serve the target populations (ex. Parents/infants) identified through the diagnostic stages of the strategy. Future recommendation indicates that "Let's Talk Vaccination, should be a component included in the "Healthy Schools" program.
Measures of Success	<p>Indicators of success:</p> <ul style="list-style-type: none"> • Participants indicate an increased knowledge of vaccination. • Participant indicate that the presenter/facilitator conveyed the information in an effective way. • An increase in request for education sessions occurs. • Facilities/agencies indicate policy changes will be made as a result of the education session.

Figure. 14

Take the Lead	
Goal	To encourage healthcare professionals to take the lead by participating in the initiative with aim to contribute to the overarching goal of raising awareness and increasing Bermuda’s vaccine coverage.
Objective(s)	<ul style="list-style-type: none"> • To raise awareness of vaccine hesitancy, and of the importance of the Flu shot • To increase the number of staff vaccinated by 50%, in comparison to the previous year. • To encourage health care professionals to lead by example in the fight against vaccine hesitancy
Initiative Background	<p>“Take the Lead” Flu Shot Day or week is an initiative designed to make the flu vaccination more accessible to target groups such as, healthcare professionals and seniors. This initiative also seeks to empower the Ministry of Health to “Take the Lead” in the fight against vaccine Hesitancy, to raise awareness of vaccination, and for participants to take control of their immune health.</p>
Methods	<p>The initial pilot of Take the Lead consisted of a 2 day flu shot drive for healthcare professionals in long term care homes and Department of Health Headquarters.</p> <p>Future recommendation: is that Take the Lead be offered to all Government Departments, and other agencies.</p>
Measures of Success	<p>Indicators of success:</p> <ul style="list-style-type: none"> • An increase in the number of Department of Health employees vaccinated with the Flu shot has occurred in comparison to the previous year. • An increase in the number of Government departments adapting/participating in “Take the Lead” occurs. • Participants indicate increased knowledge/awareness of the Flu vaccination. • Participants Express intent to participate in “Take the Lead” in the future and/or express intent to continue to get the Flu shot every year. • Participants indicate that “Take the Lead” enhances their access to the Flu shot. • Private practitioners decide to adopt “Take the Lead” or something similar.

Figure. 15

Information tools (Vaccine information cards)	
Goal	To provide information on vaccination to the public and to raise awareness of vaccination doing so in a way that strives for transparency and strengthens public trust.
Objective(s)	<ul style="list-style-type: none"> • To provide information on immunization specific to target populations and specific to vaccine preventable diseases • To empower the community with the tools to make informed decisions
Initiative Background	The aim of developing information tools is to address education as it is identified as a BDA determinant of vaccine hesitancy. The tools developed aim to maintain transparency among stakeholders and health agencies. For example, vaccine information cards are designed to provide clients information of specific vaccine preventable diseases, their symptoms, their vaccination, possible side effects, and who should and shouldn't be vaccinated.
Methods	Information tools would be available to all public and private health agencies, and will be produced by the Department of Health.
Measures of Success	<p>Indicators of success:</p> <ul style="list-style-type: none"> • Stakeholders indicate an increased knowledge and awareness of vaccination. • Stakeholders indicate that the tool is readily available and easily accessible through dissemination forums (agencies, government websites, the vaccine App). • Agencies indicate high use of the communication tool and a need to continue using it.

Figure. 16

Vaccination Phone Application	
Goal	To provide an innovative vaccine record keeping and scheduling resource to immunization program users and to provide a platform to share information on vaccination with users.
Objective(s)	<ul style="list-style-type: none"> • To inform people of upcoming vaccination appointments, and to reduce delay in immunization. • To provide clients with information on the vaccination they are receiving on that day. • To collect data on client experience with immunization services through an exit survey provided through the app. • To provide people with information on upcoming events. • To provide a link to the information on the Department of Health's website.
Methods	<ul style="list-style-type: none"> • A phone application developer will be chosen • A pilot of the Phone App will be implemented internally prior to the launch of the app. • Changes and adjustment to the phone app will be informed by user feedback.
Measures of Success	<p>Indicators of success:</p> <ul style="list-style-type: none"> • Users indicate that the phone application is easy to navigate/user friendly. • Users express that the application is effective in reminding them of vaccination appointments. • Users indicate that it is easy to access information on the Dept. website through the app. • Users indicate an increased knowledge and awareness of vaccination. • Users indicate that the phone application is a useful tool for managing their immunization schedule(s). • Users complete the agency exit survey to indicate their experience with immunization service delivery.

Figure. 17

Information tools (ex. Bus ads, social media etc.)	
Goal	To raise awareness, and to contribute to the overarching goal to increase vaccine coverage in Bermuda by 10% by the year 2021
Objective(s)	<ul style="list-style-type: none"> • To enhance public awareness of vaccination using specific messaging. • To encourage use of Bermuda’s immunization programs. • To raise awareness of vaccination/herd immunity. • To provide a better understanding of immunization to the public. • To address determinants of BDA vaccine hesitancy.
Initiative Background	These initiatives are a culmination of communication tools, marketing tools (ex. Ads), and information tools aimed to increase awareness, and to ultimately contribute to the overarching goal to increase vaccine coverage. The aim is to present messages in different platforms to reach a diverse audience.
Methods	Messaging specific to target groups will be developed, and displayed in several different ways. For example, for social media users, messaging on vaccination would be shared through avenues like Facebook, and for other stakeholders like day time TV watchers CITV vaccine information segments would be developed.
Measures of Success	<ul style="list-style-type: none"> • A considerable amount of the public have seen the messaging.

Figure. 18

Practitioner Communication tools	
Goal	To provide practitioners with communication tools that will ensure a unified approach to vaccine hesitancy that will ultimately contribute to the overarching goal to reduce vaccine hesitancy and increase vaccination coverage in Bermuda.
Objective(s)	<ul style="list-style-type: none"> • To foster collaboration with private practices that have immunization programs. • To develop standardized communication tools to be used in the private and public sector. • To foster partnerships and further engage the private sector to ensure that the strategy takes a national approach.
Initiative Background	The purpose of developing practitioner communication tools is to ensure a unified approach/response to vaccine hesitancy on a national scale rather than addressing the issue separately (ex. Private sector addressing the issue separate from the public sector).
Methods	Correspondence and collaboration with private medical practices will help to establish relationships, and provide the opportunity to find out what supports the Department of Health can provide to help address vaccine hesitancy in the private sector. Communication tools will be developed and disseminated to all relevant practices/Agencies/persons.
Measures of Success	<ul style="list-style-type: none"> • Practices/agencies agree to partnership/collaboration on vaccine hesitancy. • Practices/agencies agree on using the communication tools developed by the Department of Health. • Practices/agencies agree to use tools aimed to assess service delivery in practices. (Ex. Patient exit survey). • An increase in uptake of vaccination occurs in individual practices/agencies

Discussion and Future Recommendations

Diagnostic results of the strategy, presents promising solutions for addressing VH in the Bermuda context. In addition, there is encouraging promise of political support to address VH. It must however, be taken into consideration that the strategy does have limitations. There is no allocated funding for the strategy. Maintenance of the proposed initiatives are integrated into existing programs, however the estimated cost is \$100,335.32 for 2019 (see appendix). Some of these costs are recurrent for the entire strategy. Furthermore, there is a need to further investigate the causes of VH and systemic related barriers to access, that can further delay the diagnostic stage presenting as a limitation for implementation. In addition, making systemic changes is currently presenting as a more lengthy process, which may further contribute to continued VH. A national web-based electronic immunization registry (EIR) may assist with identifying gaps in vaccine coverage. However, the strategy excludes DoH's EIR as it is in the process of development. Ways forward for addressing these limitations may include: implementation of initial interventions and ongoing modifications to them as the strategy develops, continued small systemic changes that lead to an overarching goal, and funding commitment for initiatives developed. Below are some future recommendations that can contribute to the success of Bermuda's Strategy on Vaccine Hesitancy.

Figure 19. Ten Recommendations for Action:

1. Department of Health should foster community participation and advocacy through people centered approaches (ex. Public discussion forums, let's talk vaccination sessions, strengthening partnerships).
2. To increase awareness of Vaccine Hesitancy, Department of Health should develop information platforms, tools, and messaging targeted to the groups identified through the diagnostic phase.
3. Department of Health should take the opportunity to address public concerns about childhood vaccination therefore, truly informing the decision to vaccinate. (Community education, developing Vaccine information cards, fostering community participation etc.)
4. Each initiative should reflect consideration of Determinants (safety, education, service delivery, effectiveness of vaccines, and legislation/policy) of vaccine hesitancy and equity.
5. Further investigation of service delivery/system changes for Bermuda's immunization program should be undertaken.
6. Department of Health should aim to develop tools that would make vaccination participation more accessible (ex. Vaccine record phone application and appointment scheduler).
7. To improve efficiencies, the Department of Health should invest in information systems to identify gaps, trends and effectiveness of interventions/activities.
8. Department of Health should strive to make initiatives/interventions developed as a result of the strategy a part of Bermuda's Immunization Program overall.
9. Department of Health should strive to build capacity for the maintenance of Bermuda's Immunization Program (ex. acquire health educators, and point persons to manage the initiatives/interventions/programs)
10. Department of Health should identify partnerships that will facilitate enforcement of existing policies on vaccination, namely Education School Support Rules 2004 for childhood immunization.

Conclusion

Research of the state of vaccination in Bermuda confirms that Bermuda is at risk for VPD outbreak, as vaccine coverage is suboptimal to the recommended 95% coverage ^{(1) (5) (11) (13)}. Further investigation into the health concern through community engagement identified that there are several components contributing to the choice to or not to vaccinate. Implications of the literature suggested that vaccine hesitancy requires a comprehensive approach, further prompting the recommendation to use the TIP guide ⁽⁵⁾. Following literature review of potential interventions for VH, it is clear that TIP is the best approach as it is evidence-based, people centered, and provides opportunity to design¹ responses to VH within the Bermuda context ^{(11) (16)}. One can conclude that current discourse places TIP as an effective way to address VH in comparison to past interventions ^{(7) (8) (19)}. Bermuda's strategy on VH will strive to address the gap of possible stagnation at the implementation stage which was identified through TIP evaluation ^{(7) (8)}.

Thomas Frieden said it best when he emphasized that, "The greatest strength of public health is its singular focus on maximizing health so that society can achieve its most cherished values: that children are born healthy and grow up healthy, that students are healthy and able to learn, that workers are healthy and productive, that parents are empowered to help their children reach their full potential, that health disparities are reduced, and that people are able to age with independence and dignity" ⁽²¹⁾. In other words, Frieden's words sum up the Department of Health's overarching mission to 'Make Bermuda Healthier'. Ultimately, the purpose of the strategy is to implement innovative interventions that will contribute to increased vaccination coverage, indicate the choice to vaccinate as a positive health action, raise awareness of VH, and foster community participation in Bermuda's immunization program.

¹ Dr. Thomas R. Frieden, former Center for Disease Control and Prevention Director ⁽²²⁾.

Appendix

Strategy Proposed Budget for 2019

Proposed Initiative	Appx. Cost and options	Preferred Option	Initiative Description
Bus Ads	<p>Preferred Option</p> <ul style="list-style-type: none"> • x8 buses for 3 months (\$6,750.00) • x8 buses for 6 months <p>Other Options</p> <ul style="list-style-type: none"> • x12 buses for 3 months (\$9,585.00) • x12 buses for 6 months (\$15,930.00) <p>Note: Cost listed are inclusive of printing, coordination of all task associated with the bus ads, and putting up of Ads on the buses.</p>	<p>Initial costs: None</p> <p>Recurrent costs: (\$11,340.00)</p>	The Bus Ads would consist of messaging targeted to groups identified through the survey, and would be in circulation for appx. 6 months.
Immunization phone application	<ul style="list-style-type: none"> • App development • iOS submission fee of to publish in the iOS store. • Maintenance per month • Apple Organization Developer account 	<p>Initial costs</p> <ul style="list-style-type: none"> • \$3,750.00 • \$750.00 <p>Recurrent costs</p> <ul style="list-style-type: none"> • \$150 • \$99 	The app will serve as a recall reminder for scheduled vaccines, developmental milestones, health alerts, and vaccine updates.
Vaccine Hesitancy Commercial/Ello series production	<ol style="list-style-type: none"> 1. Cartoon development 2. Airing in theatre 1 week (1minute long) 3. Airing on BBC networks <p>Note: anticipated airing would be twice a year during peak periods.</p> <p>Other option airing during primetime 8pm-12am \$285</p>	<p>Initial costs: 1. \$1500.00</p> <p>Recurrent costs:</p> <ol style="list-style-type: none"> 2. \$500 x2 for 60 sec slot per show 3. \$350 x2 per slot (ex. 1 slot would cover it playing in the news at 7pm, 12am, 	<p>Purpose: To target parents and young children to sensitize about vaccines</p> <p>The Estimate Based on previous cost for the “Ello” cartoon.</p> <p>Note: for BBC the cost per slot decreases as the running time increases.</p>

Vaccine Information Card (VIC) Printing	Paper + printer ink	Initial Costs: None Recurrent Costs: \$500	The VICs will be disseminated to key stakeholders for public awareness.
Health Educator	<ol style="list-style-type: none"> 1. Maintain Strategy <ul style="list-style-type: none"> • 0.3 FTE 2. Development, management, and training of tools for phone app. <ul style="list-style-type: none"> • 0.1 FTE 3. Build an infrastructure within Department of Health for immunization marketing. <ul style="list-style-type: none"> • 0.3 FTE 4. Policies and procedures for use of technology. <ul style="list-style-type: none"> • 0.1 FTE 5. Social marketing components <ul style="list-style-type: none"> • 0.2 FTE <p>*FTE = Full Time Equivalent</p>	Initial Costs: None Recurrent Costs: \$72196.32 (per year).	The health educator will champion, support and sustain efforts of the strategy across the life course. This will include: social marketing and responsiveness, training, community outreach, development of protocols and full adoption of technology.
Vaccination Week of The America's Activities: Health Professionals: <ol style="list-style-type: none"> 1. Release of the VH framework 2. Communication tool 3. EPI workshop 4. Sensitization from guess speaker overseas Public: <ol style="list-style-type: none"> 1. Guest Speaker Dr. Feemster 2. Release of App Landing page 3. Release of Framework 	Health Professionals: <ol style="list-style-type: none"> 1. Release of the VH framework 2. Communication tool 3. Workshop 4. Sensitization from guess speaker overseas Public: <ol style="list-style-type: none"> 1. Public forum with guest speaker 2. Landing page development 3. Client exit survey 	Initial Costs: <ol style="list-style-type: none"> 1. \$2,000 2. \$500 3. \$2,000 4. Stakeholder Sponsorship <ol style="list-style-type: none"> 1. \$1,200 2. \$500 3. \$500 Recurrent Costs: May vary each year	Note: there is potential for small funding from PAHO Bermuda's participation in VWA supports local and regional activities for sensitizing health professionals and the public on the significance of vaccines for population health. It supports regional efforts to sustain the gains that have been achieved (e.g. Measles, Rubella and CRS elimination and polio eradication).
Total Projected Costs:	\$100,335.32		

References

- (1)** Total Research Associates, (2018). Bermuda Omnibus Survey: A Syndicated Quarterly Survey of the Bermuda Community. Devonshire: Bermuda.
- (2)** Dube, E., Gagnon, D., MacDonald, N.E., the SAGE Working Group on Vaccine Hesitancy (2015). Strategies for addressing vaccine hesitancy: review of published reviews. *Vaccine*, 33 (34), 4204-4211. doi.org/10.1016/j.vaccine.2015.04.041
- (3)** Eskola, J., Duclos, P., Schuster, M., MacDonald, N.E., the SAGE Working Group on Vaccine Hesitancy (2015). How to deal with vaccine hesitancy? *Vaccine*, 33 (34), 4215-4217. doi.org/10.1016/j.vaccine.2015.04.043
- (4)** Jarrett, C. Wilson, R. O’Leary, M. Eckersberger, E. Larson, H.J, & the SAGE Working Group on Vaccine Hesitancy (2015). Strategies for addressing vaccine hesitancy – a systematic review. *Vaccine*, 33 (34), 4180-4190. doi.org/10.1016/j.vaccine.2015.04.040
- (5)** MacDonald, N., E., the SAGE Working Group on Vaccine Hesitancy (2015). Vaccine hesitancy definition, scope and determinants. *Vaccine*, 33, 4161-4164. doi.org/10.1016/j.vaccine.2015.04.036
- (6)** Sadaf, A., Richards, J. L., Glanz, J., Salmon, D. A., & Omer, S. B. (2013). A systematic review of interventions for reducing parental vaccine refusal and vaccine hesitancy. *Vaccine*, 31, 40. doi.org/10.1016/j.vaccine.2013.07.013
- (7)** Dubé, E., Leask, J., Wolff, B., Hickler, B., Balaban, V., Hosein, E., & Habersaat, K. (2017). The WHO Tailoring Immunization Programmes (TIP) approach: Review of implementation to date. *Vaccine*, 36, 1509-1515. doi.org/10.1016/j.vaccine.2017.12.012
- (8)** World Health Organization Regional Office for Europe, (2016). Evaluation of the WHO Regional Office for Europe Tailoring Immunization Programmes (TIP) behavioural insights tool and approach. Retrieved from http://www.euro.who.int/__data/assets/pdf_file/0010/334684/TIP-evaluation-report.pdf
- (9)** Rappuoli, R., Pizza, M., Del Giudice, G. & De Gregorio, E. (2014). Vaccines, new opportunities for a new society. *Proc Natl Acad Sci USA*, 111, 12288–12293. doi.org/10.1073/pnas.1402981111
- (10)** Tognotti, E., (2010). The eradication of smallpox, a success story for modern medicine and public health: what lessons for the future? *J Infect Dev Ctries* 4(5):264–266.
- (11)** World Health Organization the Regional Office for Europe, (2013). The Guide to Tailoring Immunization Programmes (TIP): Increasing coverage of infant and child vaccination in the European Region. Retrieved from http://www.euro.who.int/__data/assets/pdf_file/0003/187347/The-Guide-to-Tailoring-Immunization-Programmes-TIP.pdf
- (12)** Ministry of Health (2017). Health in Review 2017: An International Comparative Analysis of Bermuda Health System Indicators, 2nd Edition. Ministry of Health: Bermuda
- (13)** Pan American Health Organization, (2017). EPI Country Report Bermuda, 2017. Retrieved from <https://www.paho.org/hq/index.php?lang=en>
- (14)** Goldstein, S., MacDonald, N.E., Guirguis, S., S.A.G.E. the Working Group on Vaccine Hesitancy (2015). Health Communication and Vaccine Hesitancy. *Vaccine*, 33 (34), 4212-4214. doi.org/10.1016/j.vaccine.2015.04.042

(15) Nowak, G., Gellin, B., MacDonald, N.E., Butler, R., the SAGE Working Group on Vaccine Hesitancy (2015). Addressing vaccine hesitancy: the potential value of commercial and social marketing principles and practices. *Vaccine*, 33 (34), 4204-4211. doi.org/10.1016/j.vaccine.2015.04.039

(16) World Health Organization, (2018). Tailoring Immunization Programmes (TIP): An Introductory Overview. Retrieved from https://www.who.int/immunization/programmes_systems/Global_TIP_overview_July2018.pdf

(17) Strategic Advisory Group of Experts on Immunization, (2017). 2017 Assessment Report of the Global Vaccine Action Plan. Retrieved from https://www.who.int/immunization/sage/meetings/2017/october/1_GVAP_Assessment_report_web_version.pdf

(18) World Health Organization, (2013). Global Vaccine Action Plan 2011 - 2020. Retrieved from https://www.who.int/immunization/global_vaccine_action_plan/GVAP_doc_2011_2020/en/

(19) Butler, R., MacDonald, N. E., & the SAGE Working Group on Vaccine Hesitancy, (2015). Diagnosing the determinants of vaccine hesitancy in specific subgroups: The Guide to Tailoring Immunization Programmes (TIP). *Vaccine*, 33 (34), 4176-4179. doi.org/10.1016/j.vaccine.2015.04.038

(20) Lobo, R., Petrich, M., & Burns, S., (2014). Supporting health promotion practitioners to undertake evaluation for program development. *BMC Public Health*, 14, 1315. doi.org/10.1186/1471-2458-14-131529

(21) Frieden, T. R., (2014). Six Components Necessary for Effective Public Health Program Implementation. *American Journal of Public Health*, 104, 17-22. doi/abs/10.2105/AJPH.2013.301608

(22) Centers for Disease Control and Prevention, (2018). Past CDC Directors/Administrators. Retrieved from <https://www.cdc.gov/about/history/pastdirectors.htm>

