Beyond Utility

Analyzing Unseen Infrastructures of Necromobility

by
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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions as accepted by my examiners.I understand that my thesis may be made electronically available to the public.

ABSTRACT

The year 2020 was unprecedented on varying accounts but will undoubtedly be remembered by a global pandemic bringing the world to a shuddering halt. As nations scrambled to flatten the outbreak's curve, the virus tested the capacity of healthcare systems and local morgues, and with the overwhelming number of fatalities came the shocking images of the pandemic's consequences: the erection of temporary morgues and mass graves. While current measures inherit guidelines by global authorities, the Canadian government has yet to provide a tailored approach that addresses local limitations and resources in times of mass fatalities.

As hospitals and morgues operated near capacity at the start of pandemic system, monumental efforts have been made to alleviate pressures on our healthcare system,while deathcare remains in a historically precarious state. With increasing rates of death, various ad-hoc solutions have emerged to supplement unit capacities and to facilitate social distancing at traditional services. Acknowledging that present research predisposes care of the living, *Beyond Utility* aims to shed light on the invisible industry that cares for the dead and its crucial role in maintaininig public health. By documenting the journey of bodies, from time of death to final disposition, the unseen processes within the deathcare industry captures a system that has been historically overlooked, understaffed, operating near capacity.

Using case studies of deathcare crises in Ontario, research addresses inherent spatial constraints within institutions, conflicting interests between stakeholders and legislations, and programmatic limitations from ad-hoc constructions. While the unexpected deaths due to COVID-19 have only further strained deathcare operations, *Beyond Utility* argues the permenance of ad-hoc constructions, the adaptability of current deathcare practices, and the need for collaborative planning between agencies and disciplines as service demands rise.

ACKNOWLEDGEMENTS

I would like to acknowledge the following group of wonderful humans as this would not have been possible without you.

To my supervisor, Maya Przybylski, thank you for joining me on this crazy journey and for your continued encouragement and support. Our conversations helped me gain insight and clarity, but more importantly, illuminated the perspectives of those I was researching, and to create a more thoughtful narrative. Thank you for sharing your wisdom and helping me navigate the intracacies of an otherwise forboding breadth of work.

My sincerest thanks to my committee member, Jane Hutton, for your time and thoughtful critiques. Our conversations encouraged me to embrace the work and to inspire others.

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INTRODUCTION

While 2020 marked the start of an unprecedented era filled with uncertainty, fear, sickness, and death, two years later, the world is still struggling to contain COVID-19. Despite a global effort to limit the spread of the virus, local healthcare systems worldwide remain strained as reports of new strains continue to populate our news. As of December 2021, the global cumulative death count sits at 5,285,888. 1 The North American region has reported 2,369,006 deaths as the leading global region and accounts for nearly 50% of all cases. [2]

While the underlying cause for these fatalities is attributed mainly to the COVID-19 pandemic, radical spikes in death rates are a concern for public safety and governments. Researchers and policymakers identify global phenomena such as the current pandemic as a Mass Fatality Incident (MFI). At a high level, MFIs represent a lack of fatality management resources where more deaths occur than can be handled by local authorities. They may result from natural and human-caused events such as fires, floods, earthquakes, or Chemical, Biological, Radiological, Nuclear, or Explosive (CBRNE) incidents and are often uniquely addressed depending on the region's climate, existing infrastructure, and available resources. (BCCS Mass fatality Response Plan) Despite global efforts to contain the spread of COVID-19, the mounting number of deaths has severely taxed every nation's capacity to manage casualties- leaving local authorities in a perilous state.

The pandemic has highlighted a disparaging prioritization in healthcare facilities over those providing deathcare. This popularized interest has allowed for expanding existing Intensive Care Unit (ICU) capacities and has undoubtedly been critical in alleviating pressures on healthcare systems. However, like healthcare, deathcare facilities are crucial to community health, and unprecedented death rates have pushed at-capacity units to create ad-hoc solutions.

Fig 1-1 Illustration of mourners in Brazil

Those in attendance are required to wear face masks and to social distance from other attendees who may not be in their bubble.

1 "Region of the Americas Update." https://iris.paho.org/bitstream/handle/10665.2/55422/COVID-19Daily-Update9December2021_eng.pdf?sequence=1&isAllowed=y. PAHO, n.d.

2 Fisher, J. WHO/SEARO Technical Notes for Emergencies: Disposal of Dead Bodies in Emergency Conditons. Technical Note No. 8. https://www.who.int/water_sanitaton_health/hygiene/emergencies/deadbodies.pdf?ua=1 Accessed 15 Nov. 2020.

WHAT IS DEATHCARE?

The deathcare industry was first documented in 1987 [2] and described as the act of relating to or providing products or services for the burial or cremation of the dead. While this definition describes the funeral industry, body repatriation practices and memorializing loved ones have evolved. Premises of deathcare have moved beyond funeral industry and impacts many still alive. Where critically ill patients once bound to hospital beds now foresee treatment; morgues once used for housing the deceased now help investigate their death, and cemeteries once tied to religion now cater to all beliefs and socio-economic backgrounds. From the economic perspective, deathcare can be understood as a commercial enterprise that offers services and goods and is classified as an industry defined by its primary business activity. From this perspective, the importance of deathcare work is substantiated by its growing market and the ever-increasing services it provides.

As a whole, the deathcare industry provides dedicated but niche services to the recently deceased and their communities. Due to the need for privacy, their operations are often unseen and therefore ambiguous to the general public. The following section provides an overview of components and stakeholders within the death care industry with key stakeholders that will be discussed in the following research.

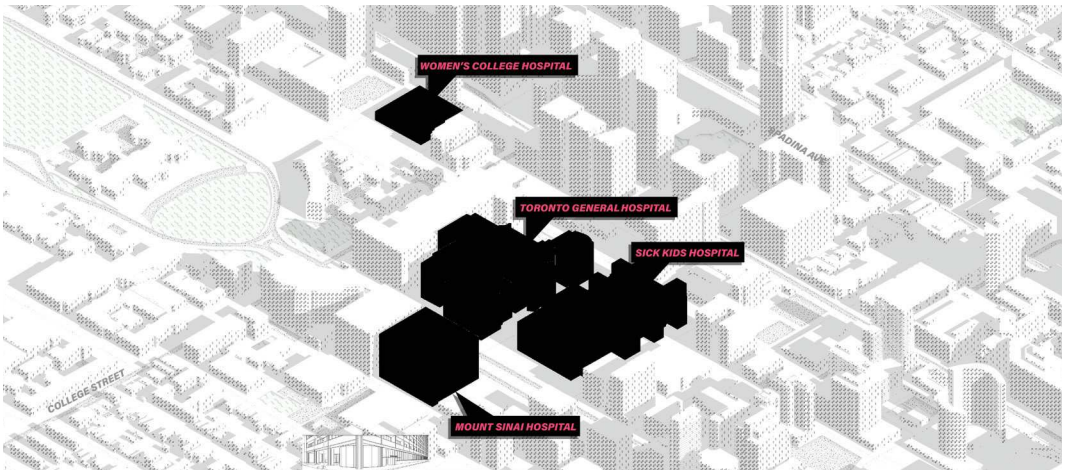


Fig 1-2 Section of Toronto and Typically Overlooked Deathcare Units Isometric illustration of Toronto downtown cor at intersection of College and Queen's Park. Highlighted buildings represent prominent landmarks within the community, but lesser known is their role in deathcare services.

Thanks to the proliferation of hospital sitcoms and a growing interest in true crime and serial murder documentaries, many of us may have an ingrained picture of large stainless steel doors and a doctor working over a covered body in a dim-lit room. As a society, we are fascinated with death, with the possible brutality of evil that one human can inflict on another, but of course, only from the comfort of our living room couches. While patient units are guarded, with access privy only to patients and their families, their documentation is scattered through the internet in the form of hospital floor plans geolocated snaps, and project bid proposals. The documentation of unseen spaces is particularly challenging in the death care typology and more for morgues. These spaces are often private, situated below ground, and limited access to even those working within the larger facility.

While services provided by each sector help understand the stakeholders involved, unit typologies and interactions between sectors are often unseen. This is due primarily to society's stigma and discomfort in discussing death, but more importantly, practical deathcare work is usually executed with discretion. To elaborate, the event of death is the loss of a loved one, and affected families are understandably distraught, in grief or demanding answers. Deathcare workers are burdened with the responsibility of their work and act as mediators in comforting those still alive. Therefore, deathcare work must be prompt, professional, and respectful of the diseased and their communities.[3] As a handbook, *Beyond Utility* aims to clarify the otherwise unseen operations of the deathcare industry by providing a consolidated guide to government policies and unique operational guidelines that affect Toronto's deathcare sectors.

3 De Jesus, Vivian. *"Essential Death Care Workers,"* June 2020. https://bioethics.jhu.edu/wp-content/uploads/2020/06/Essential-Deathcare-Workers-Final-Briefing-Book.pdf.

Fig 1-3 Diagram of deathcare related industries
Diagram illustrates prominent industries within Canada. Highlighted text represents stakeholders and services that enable or interact with the deathcare sector.

FRAMEWORK FOR CANADIAN DEATHCARE

Governments support the development and maintenance of infrastructure for their citizens, where types of infrastructures may be water facilities that are necessary assets for community health or telecommunication networks that have tangible impacts on the overall economy. The Canadian federal system has set a robust framework for death investigations and processes.

DEATH INVESTIGATION

While the structure and processes of death investigations can vary between regions, state law and local practices, the combined process of data collection and interpretation to determine the cause of death is traditionally known as a medico-legal death investigation or also autopsy. Oftentimes, the purpose of autopsies may initially be interpreted to serve the private needs of the family; in truth, data collected from the cause and circumstance leading to death serve a larger public need. At a high level, these functions include:

1. fair and accurate adjudication in criminal and civil cases
2. maintenance of accurate vital statistics
3. effective public health surveillance and response
4. advances in health and safety research, and
5. improvement in quality of heath care

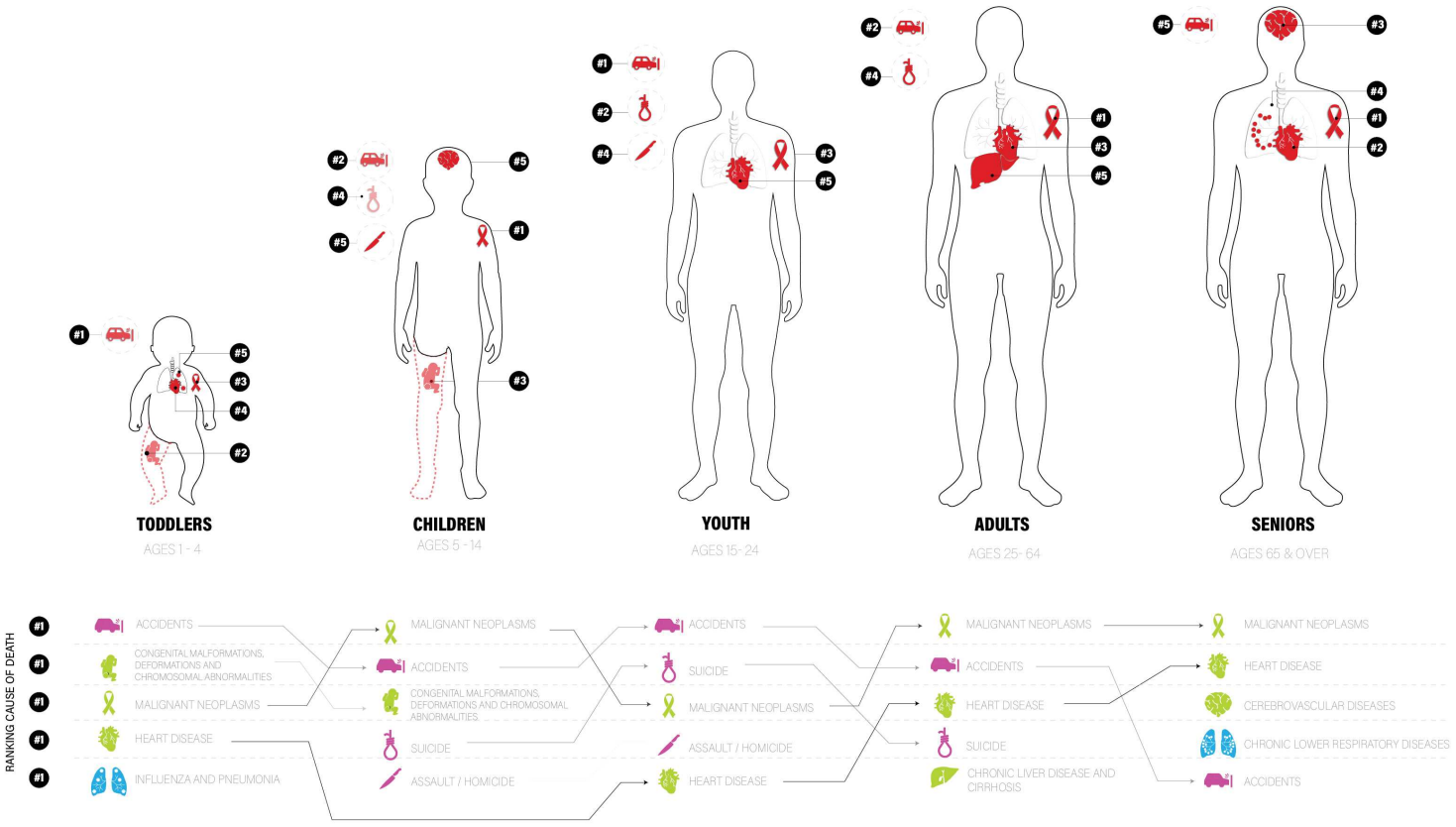


Fig 1-4 Illustration of Leading Causes of Death in Ontario in 2019 By Age Group

DEATH DATA COLLECTION

To conduct these services, data collection is completed at both the regional and provincial level. This is important to note as, before 2008, the Statistics Canada's Canadian Vital Statistics: Death Database (CVS-D) contained only national statistics distilled from provincial death data forms. As provinces had variable data elements they collected, stored and reported, there was no central database for the national coroner or medical examiner data. To acquire details surrounding the cause of death, researchers would need to visit each of the 13 provinces or territories and consult with respective death investigation offices for relevant records. Understanding the growing need for more accessible and standardized data, especially in understanding fatal injuries, a standardized provincial data collection system, the Canadian Coroner and Medical Examiner Database (CCMED), was developed as in place today. [4]

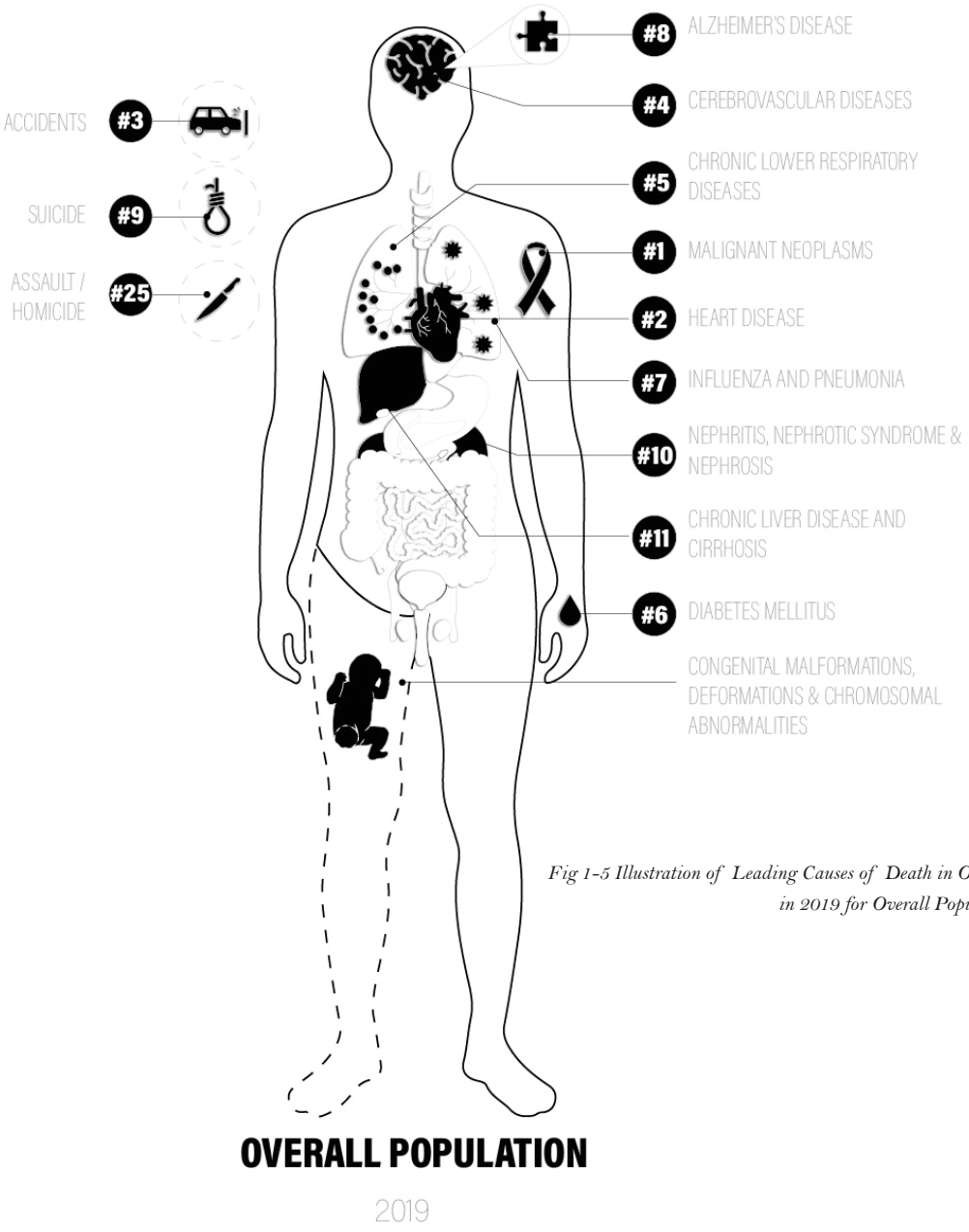


Fig 1-5 Illustration of Leading Causes of Death in Ontario in 2019 for Overall Population

4 *"Canadian Coroner and Medical Examiner Database."* Statistics Canada, December 8, 2021. https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5125.

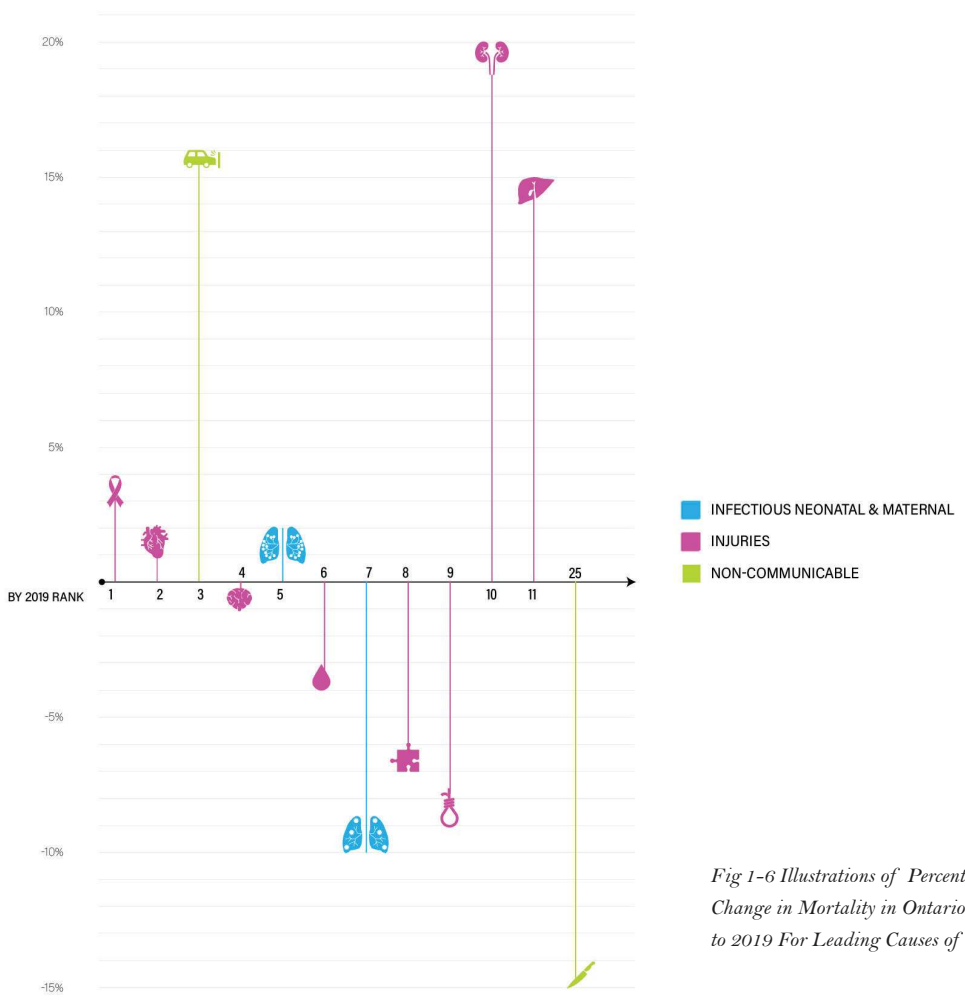


Fig 1-6 Illustrations of Percentage of Change in Mortality in Ontario from 2015 to 2019 For Leading Causes of Death

THESIS STRUCTURE

The existing deathcare infrastructure in Ontario, including its inherent processes and unit capacities, has largely remained unchanged from the 1990s to the early 2000s. From the Goudge Inquiry of 2008 ,many death investigation systems in Canada have a strained relationship with the provincial governments and experience issues with inadequate staffing and funding.[7] However, issues of performance and accountability are also apparent in the patient care and bereavement services sector, and, steps to address these concerns have only recently begun in the past decade with the implementation of new legislations (Long-Term Care Home Act, 2007), additional resources (Ontario's Centre of Forensic Sciences in 2012) and regulating authorities (the Bereavement Authority of Ontario in 2016). With current research predisposing facility design for healthcare patients[8], *Beyond Utility* seeks to give clarity into Ontario's processes for dead body management and examines changes within the three predominant deathcare service sectors and how current operations have remained strained. To address preconceptions of deathcare work, an overview of Ontario's death investigation system is used to outline the critical role deathcare plays.

Fig 1-1 Legend of Crisis Timeline within Ontario's Deathcare Industry

In part one, *Introduction*, research gives a general account of deathcare work, beyond the bereavement sector, and illustrates typical infrastructures needed to ensure public safety. While the emergence of deathcare work is relatively new in North America, there is an increasing demand for services and accountability for stakeholders from the medical, legal and service industries in every Canadian city.

In part two, *A Technical Guide to Deathcare*, research focuses on Ontario, where the deathcare industry is broken down into three main sectors: patient care, death investigation, and bereavement services. Physical landmarks unique to each sector are used to study typical unit typologies, and spatial and temporal qualities help visualize otherwise unseen operations.

7 https://healthydebate.ca/2020/02/topic/death_investigation_feb2020/

8 Hill, Andrea D., Therese A. Stukel, Longdi Fu, Damon C. Scales, Andreas Laupacis, Gordon D. Rubenfeld, Hannah Wunsch, et al. *"Trends in Site of Death and Health Care Utilization at the End of Life: A Population-Based Cohort Study."* CMAJ Open. Canadian Medical Association Open Access Journal, April 1, 2019. https://www.cmajopen.ca/content/7/2/E306.

In part three, *A Timeline in Crisis*, specific deathcare crises are used to identify bottlenecks at critical pinch points. As these issues have emerged in the same sequence for all Ontario deathcare sectors, a timeline of crisis is adopted (see Fig 1-8) This starts with the Precedence Crisis, then the Programming Crisis, and finally the First Acute Crisis, which coincides with the current global pandemic. In each crisis, visible changes such as fluctuating fatality rates or unit caseloads have impacted otherwise unseen operations. Throughout this timeline, operations are often near or at-capacity, where stakeholders have had to resort to ad-hoc solutions to address deficiencies. As these events multiply and grow, existing services are impacted and unit operations are further constrained. While temporary solutions range in efficacy, deathcare units have historically operated under precarious conditions and the pandemic may only be a precursor to a larger crisis.

In part four, *Ad-Hoc Solutions and The Next Acute Crisis*, unprecedented caseloads from a global pandemic have resulted in temporal interventions, where an influx of new spaces or processes have changed the visibility of deathcare. From prior crisis, Ontario's death care industry is constrained by limited staffing within units, challenges in professional accreditation and education, oversight in governance and funding and temporal constraints within existing operations and facilities. While alternate solutions are explored in nations that had past success in addressing resource constraints, less prepared units may soon face another acute crisis due to a quickly aging demographic of baby boomers.

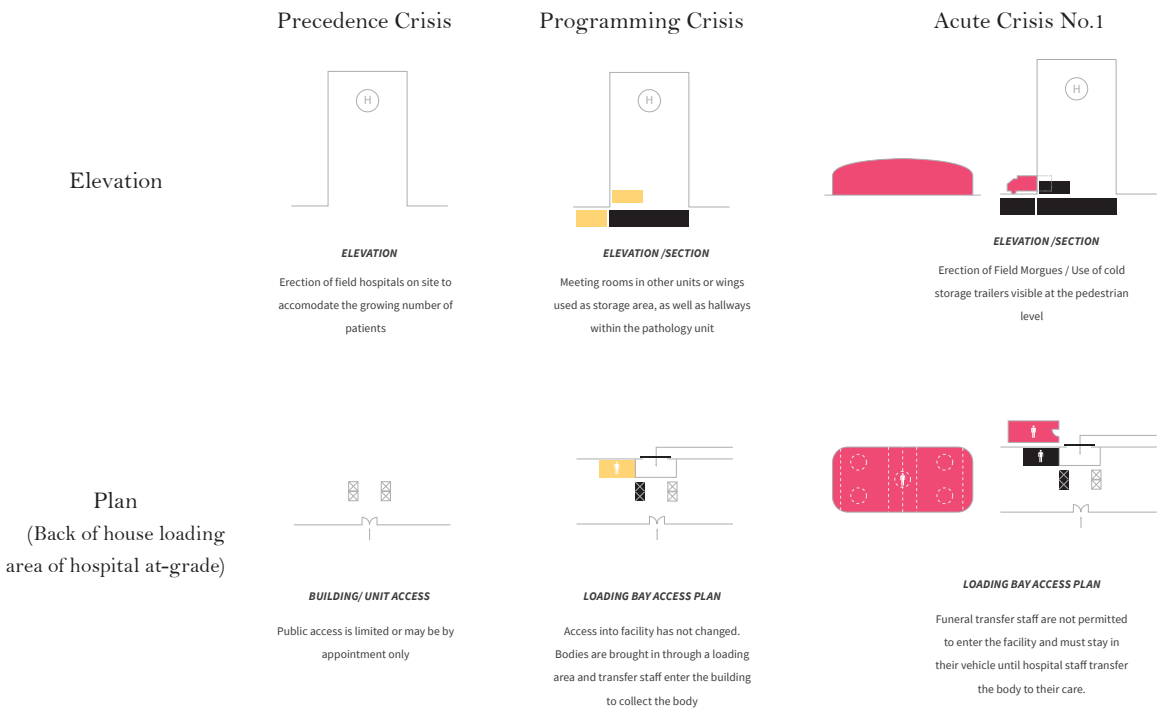


Fig 1-7 Example of A Typical Deathcare Unit With Documented Visibility Changes Highlighted By Referencing Crisis Colours
Using the hospital morgue as an example, the unit is shown in two perspectives: elevation and plan. Visibly changes in the Programming Crisis include overflow in the basement morgue and storage of bodies in other parts of the hospital above-grade. Changes during Acute Crisis No.1 show the erection of field morgues and the use of cold storage trailers to supplement facility capacities.

RESEARCH METHODOLOGY

To understand the movement of bodies and caseload capacities of individual units, initial research focused on understanding existing protocols for body transfers within Ontario. The history of unit operations throughout the three sectors is relatively new compared to other industries, such as the medical or manufacturing industry. Still, it has quickly evolved due to the demands of a growing urban core, the proliferation of elaborate ceremonies, and the changing roles of government, religion and communities. There has not been a time of more information sharing between governments, corporations and independent researchers.[9] Healthcare researchers use infection rates, unit caseloads, and demographic datasets created an unseen scale of open data that have been further developed for their geospatial qualities and synthesized to provide visual predictions of airborne particles. With these successes, initial research for *Beyond Utility* adopted a similar approach. The collection of demographic and geospatial datasets was envisioned to visualize the trajectory of unit operations as cases of mortality fluctuated. The drawing process enabled a further understanding of the typologies within deathcare and their spatial qualities. Outlining the distinction of what was purposely made invisible within institutions such as hospitals (see Fig 1-9) gives a perspective of the delicate processes in place to ensure privacy and dignity for the deceased. Alternatively, it reinforces the anonymity of the deathcare system and its segregation from the world of the living. Drawings produced in *Beyond Utility* help visualize the precise nature of the deathcare sector and the discretion required and often taken for granted in necromobility.

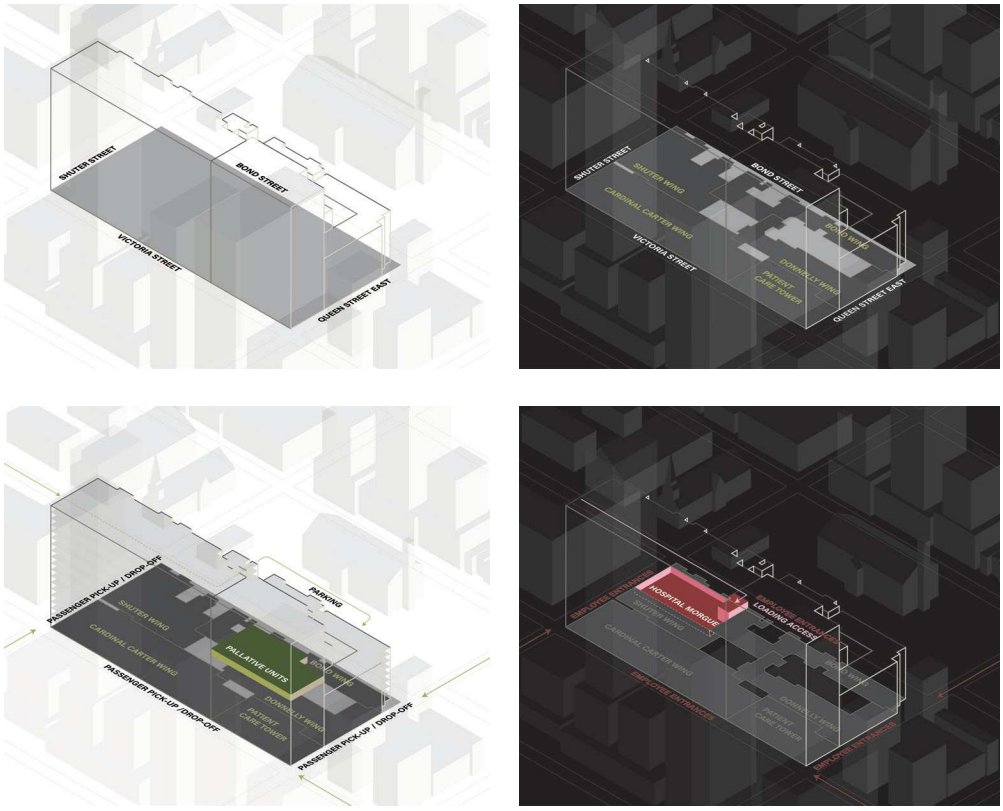
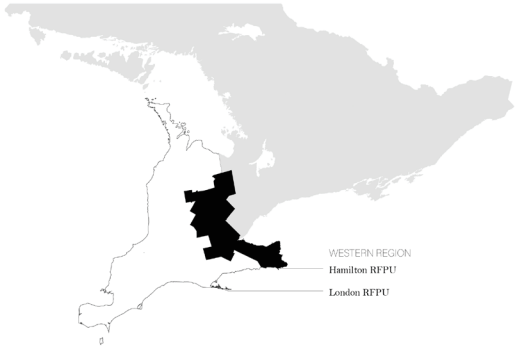


Fig 1-8 Diagram of Typically Seen and Unseen Programs in Institutions

St. Michael's Hospital in Toronto used as an example to show location of patient care units above-ground in relation to the hospital morgue located below-ground

9 Dron, L. *"Data Capture and Sharing in the COVID-19 Pandemic."* Digital Health. The Lancet, October 1, 2022. https://www.thelancet.com/journals/landig/article/PIIS2589-7500(22)00147-9/fulltext.

1. Increased cases of death in Ontario's eastern forensic pathology region



2. Western region capacities impacted due to closure of largest regional unit

Fig 1-9 Diagram of Death Investigation Regions in Ontario Impacted By An Influx of Caseloads

3. Unit capacities in two out of four regions heavily strained at the height of pandemic infection rates in Ontario

GEOSPATIAL DATASETS & MAPPING

Research portals used included Statistics Canada, the Government of Ontario, the City of Toronto, Bereavement Authority of Ontario (BAO), and the Ontario Death Investigation Oversight Council (DIOC). Academic papers and reference books were located using The University of Waterloo's library and accessed through Scholar's Portal with software references on the Esri website. Through Waterloo's Geospatial Centre, datasets unavailable on open portals, such as the Ontario Road Network, Building Footprints Region, and Cemeteries Region, were retrieved from CanMap® and created by the location data company DMTI Spatial. Dataset analysis was completed in the ArcGIS Pro Esri software, with iterative trials of supplementary datasets manipulated in Microsoft Excel. Sequence and timeline of operations referenced government reports and department websites which provided a high-level description of death investigation work in the province and the inter-agency collaboration in place. Unfortunately, data for more tangible details, such as the allocation of funding for individual units or the location and physical dimensions of units, was often unavailable or inconclusive. Information found in department reports or facility websites was often biased and could not be verified by a secondary source. Understandably, characteristic details associated with hospitals and government facilities are a security concern, and units involved with investigations or patient deaths are classified due to the nature of such cases. While unsuccessful in this approach, the perspective accounts of users were identified as a more definitive and abundant resource, and research used illustrations to superimpose their accounts into otherwise unseen spaces. While the analysis was comparatively more successful using drawings and diagrams, the process required overcoming communication challenges such as illustrating complex temporal relationships, creating a succinct narrative between different typologies and compressing large bodies of data into synoptic graphs.

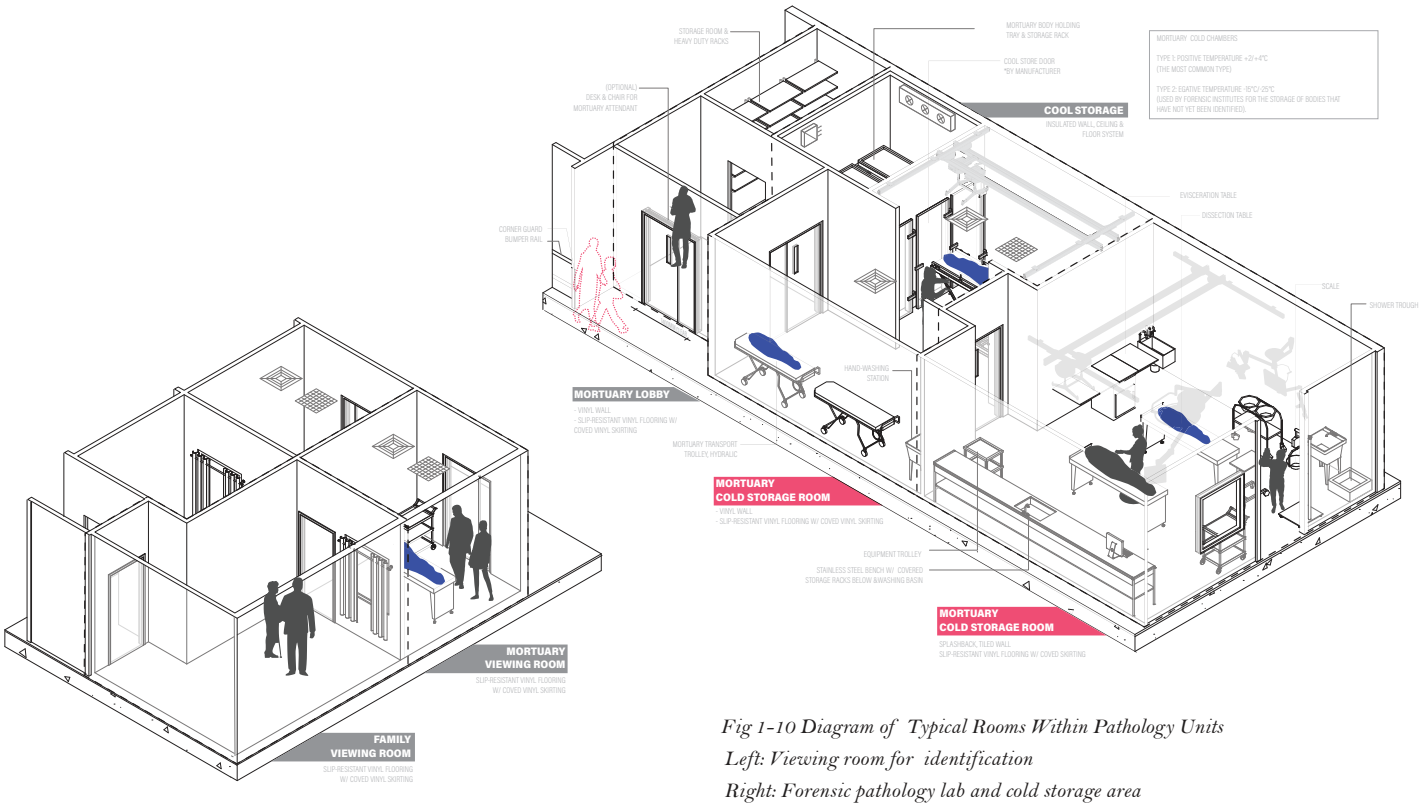


Fig 1-10 Diagram of Typical Rooms Within Pathology Units
Left: Viewing room for identification
Right: Forensic pathology lab and cold storage area

DRAWING AND ILLUSTRATIONS

The research methodology for beyond Utility begins with open source data collection from government bodies, such as the census, geospatial files from institutions, and data charts from individual organizations, such as the solicitor general annual publications. data relating to the various death care sectors are then compiled and sorted by service sector, place of origin and timeline, and translated into maps, illustrations or diagrams that coincide with healthcare crisis colors .

Chronicling the journey of a dead body within the city - from the place of death to its final resting ground, the movement of dead bodies is presented in a diagram to identify key stakeholders. This includes the physical institutions, the professionals within the field, and the unique services provided upon delivery of the body. Illustrations of units such as the forensic pathology unit (see Fig 1-11) informs the services offered by the deathcare industry and institutions within its infrastructure. Narration in a non-linear timeline aims to re-inforce the precarious and destabilized deathcare system, and isometric illustrations represent a third-person or birds-eye perspective, detached from other activities. Images of documented events have been included to provide a first-person perspective of an otherwise surreal or detached system and rendered in monochrome where pertinent elements are highlighted with the related crisis. A continuous color legend was developed based on the crisis-era to differentiate the events' timeline. The same color coding is carried throughout the work and can be seen in growth charts, unit diagrams, and event timelines documenting unit changes. Referencing facility guidelines, academic journals and equipment manufacturer brochures, isometric views represent the physical qualities within units and the hierarchy of spaces. These illustrated spaces capture user experiences through found perspectives from news reports, interviews and union announcements and give insight into the temporal quality of rooms with typical users and activities. A matrix catalogs changes within each typology by indicators associated with user experiences. A visibility diagram is built on the shared characteristic of anonymity between deathcare typologies and their work's more significant operational invisibility. Indicators in the chart represent the perspective of those it interacted with: staff working in the unit, patients or users entering its premise, and the larger community that recognized its presence.

INHERENT CHALLENGES WITHIN DEATHCARE

As health crises in communities arise, reports of unseen operations becoming more visible suggest underlying challenges within the deathcare sector that are proportionally less publicized. While challenges within each deathcare sector are unique and will be further explored in Part 3, A Timeline in Crisis, their ability to operate unseen has become a more prominent indicator of success. Despite this bias, the visibility of deathcare work does not have a proven correlation to the performance of deathcare services.[10] For the public, the change in operation visibility is a trending debate regarding the privacy and dignity of the deceased, and the ability for units to operate unseen has become increasingly difficult during the COVID-19 pandemic.

Due to the circumstances of their work, the operations of deathcare units are mainly unseen to the general public. These operations can be classified as unseen and seen, where the need for discretion directly affects their performance evaluation. Examples of this include interaction with the bodies of the deceased, where workers often cover the deceased's body to preserve their anonymity and dignity. Other instances include the transportation of bodies to a funeral home (see Fig 1-12) or a temporary location for storage, where medical s and transportation staff interactions are often unseen to the public. In addition to the need for discretion, operations are also time sensitive due to various concerns. Categorization may fall under medical and personal, where preservation of biological material is needed for the investigation, identification or donation purposes, and internment needs to be dictated by religious practices.

While provinces have adopted one of two death investigation systems, the coroner system or the medical examiner system, the differing practices for death investigations and resulting statistics have been inconclusive in understanding death trends in Canada. Understanding the need to synthesize current records between municipalities, a new national database was developed. Since its adoption, the CCMED has aimed to synthesize varying statistics. Still, ingrained practices in each city have yet to transition, and local coroner and medical examiner systems continue to evolve. In Ontario, institutions are required by their respective ministries to provide high-level reports to the general public. Unfortunately, these evaluations are historically biased or inconsistent in statistics and will be further discussed in part two, *A Technical Guide to Deathcare Infrastructure.* For individual sectors, technical indicators such as completeness of work and time for case turnaround may be more pertinent to accessing performance. Unfortunately, these statistics are not collected across all sectors of deathcare work, limiting the ability to evaluate sectors objectively, and is further exasperated due to the limited shared reporting parameter. and their communities.

Since the start of the pandemic, governments and institutions have become more proactive in collecting death data, however, death statistics have historically been piecemeal, with parameters being industry specific for internal charting (e.g.. Statistics Canada had death relating to the cold/ deaths of Canadians rather than) or general (deaths of males vs females) As the scale for dissemination varies not only between countries and provinces, relative information needed to dissect issues across all sectors of death care is comparatively challenging to retrieve, especially compared to healthcare statistics.

10 Zavattaro, Staci. *"When Deaths Are Dehumanized."* SAGE Journals, June 15, 2021. https://journals.sagepub.com/doi/10.1177/00953997211023185.

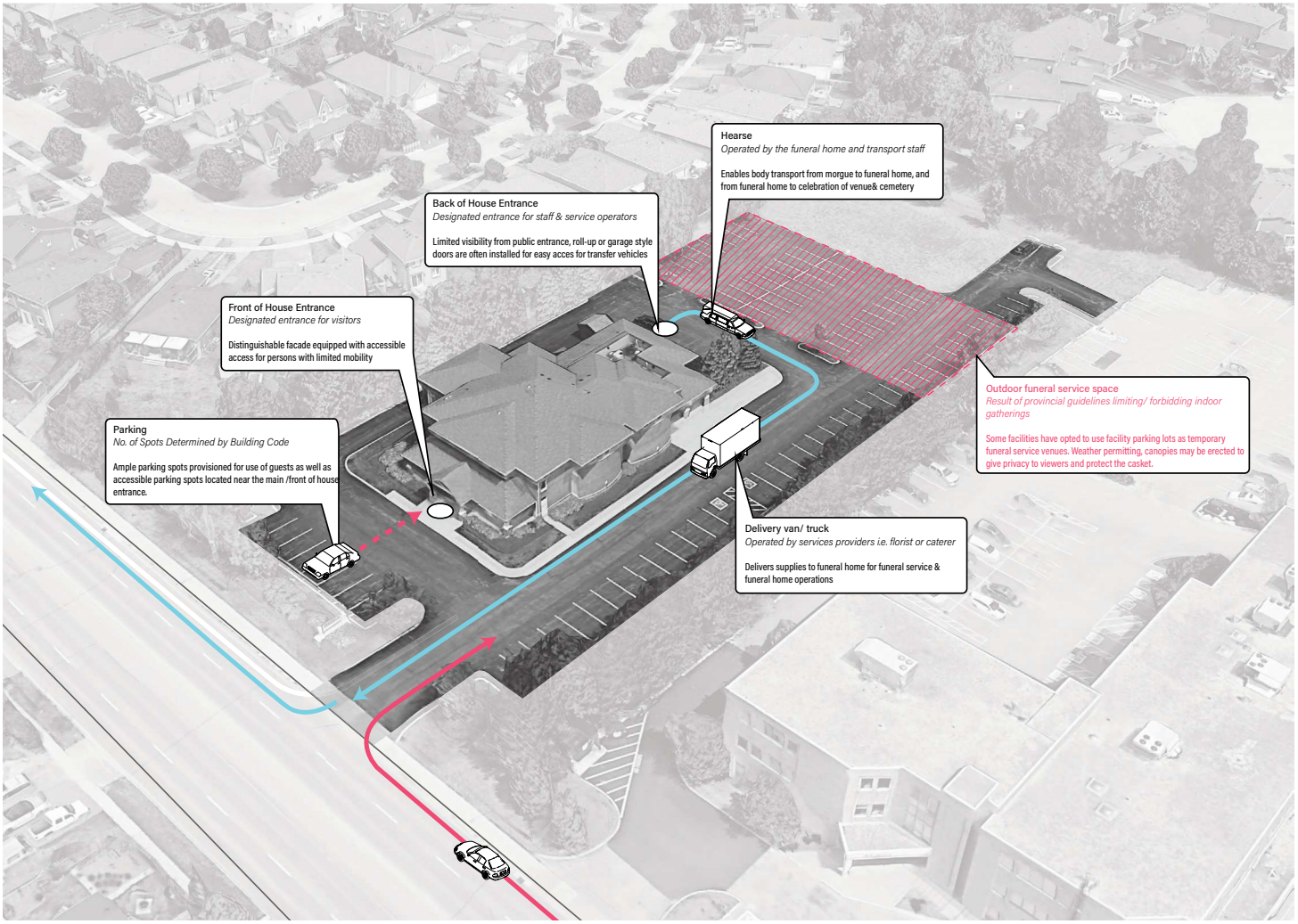
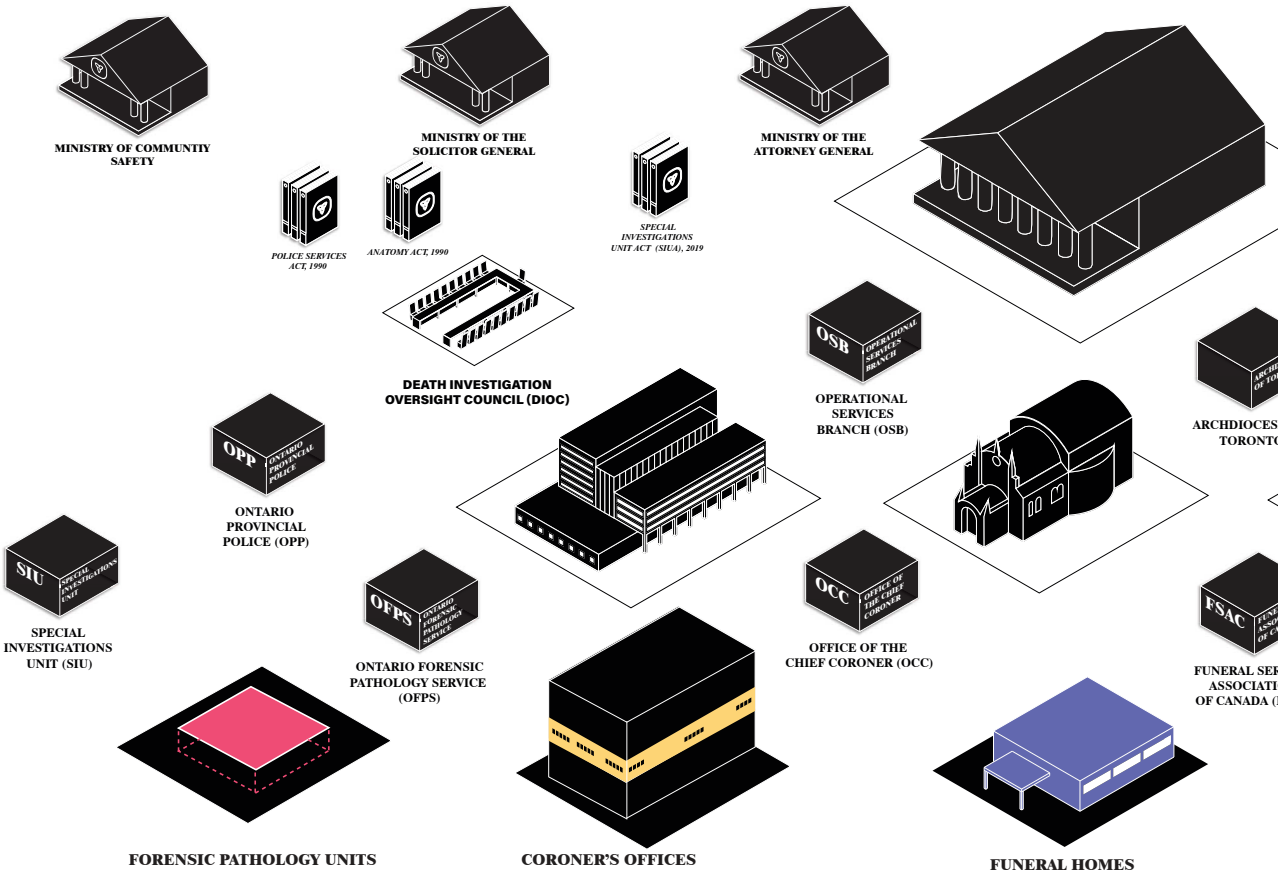


Fig 1-11 Diagram of facility access at Adam's funeral home for different users

UNSEEN INFRASTRUCTURES



While the deathcare infrastructure in North America may no longer be in its infancy, it still faces many challenges due to the operational needs of facilitating internment within a designated time frame and the precarious nature of the work where practitioners need to preserve the dignity of the deceased while addressing concerns of the family and also the community. In Ontario, deathcare is an industry carried out by various institutions (see Fig 1-13), regulated and monitored by the state. It involves the livelihood of millions who work within, or interact with, deathcare institutions. While the cycle of operations may vary depending on the community's needs and the operational capacities of individual units, their actions have further implications that impact other industries (i.e. Manufacturing) and sectors (e.g. The public sector).

As architects and designers, we tend to gravitate toward new and innovative architecture and design. We celebrate creating spaces that transport us or define an experience and miss the day-to-day areas inhabited by users different from ourselves and overlook the everyday spaces. The death care industry is integral to each city that employs workers, serves families, and enables forensic and medical work integrity. Despite inherent needs to address funding, shortage of resources, and an impending demographic change of aging baby boomers, these physical institutions have historically operated in a precarious state - until the unprecedented outcomes of a global pandemic. The mounting numbers of excess deaths have placed this sector under immense stress, from palliative and post-mortem to grief, to expedite normal processes and

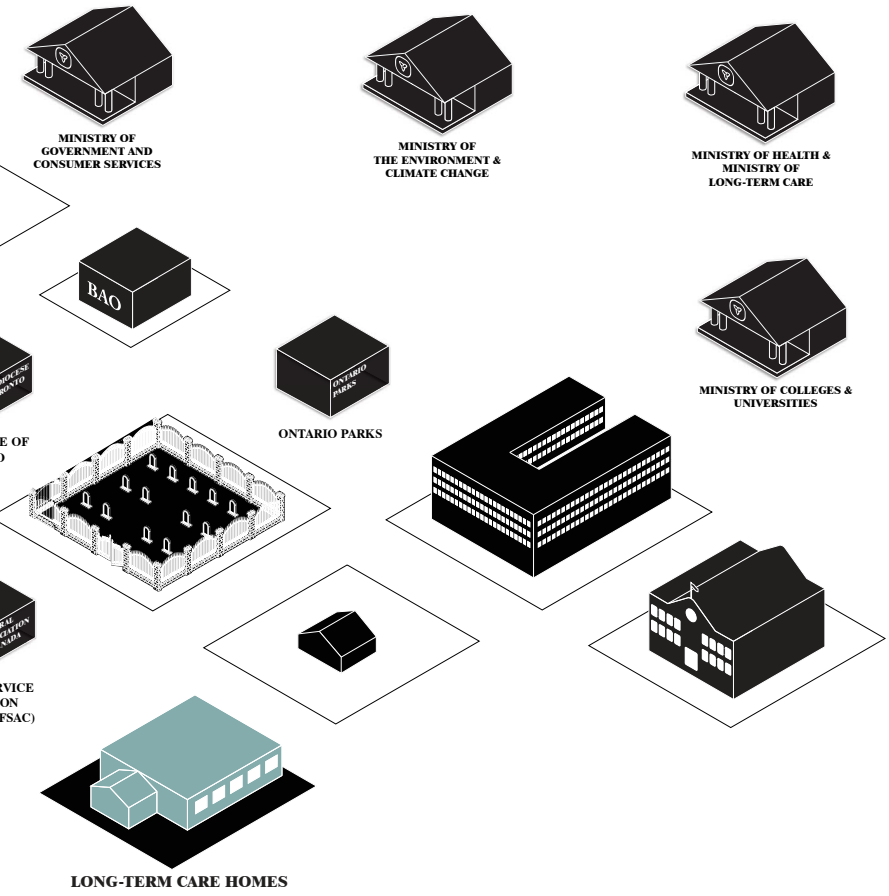


Fig 1-12 Diagram of Legal Stakeholders in Ontario's Deathcare Industry

Stakeholders in Ontario's Deathcare Industry including typical legislative bodies, governing policies, unit typologies and operators

avoid stockpiling bodies.[11] Still, more importantly, their success provides cities like Toronto the luxury to prioritize the well-being of the living. With growing demands in end-of-life services and an unprecedented global aging population , *Beyond Utility* challenges the predisposition of facility design for healthcare patients[12], and the need for resource appropriation for deathcare units. This thesis seeks to understand design requirements for deathcare patients and the existing infrastructure for dead body management. While both industries are critical in maintaining public health and safety, deathcare units have been historically underfunded and understaffed and operate at near capacities to reduce deficiencies. With the prominent need to preserve dignity and respect for the deceased and their surviving community, deathcare workers are tasked with discretion while conducting prompt examinations to facilitate body repatriation to families

11 *"HOW THE PANDEMIC HAS IMPACTED THE DEATH CARE INDUSTRY."* MKS&H, January 21, 2021. https://mksh.com/how-the-pandemic-has-impacted-the-death-care-industry/.

12 Pivodic L;Pardon K;Morin L;Addington-Hall J;Miccinesi G;Cardenas-Turanzas M;Onwuteaka-Philipsen B;Naylor W;Ruiz Ramos M;Van den Block L;Wilson DM;Loucka M;Csikos A;Rhee YJ;Teno J;Deliens L;Houttekier D;Cohen J; ; *"Place of Death in the Population Dying from Diseases Indicative of Palliative Care Need: A Cross-National Population-Level Study in 14 Countries,"* Journal of epidemiology and community health (U.S. National Library of Medicine), accessed October 10, 2022, https://pubmed.ncbi.nlm.nih.gov/26202254/, 17-24.

Part 2

A TECHNICAL GUIDE TO DEATHCARE INFRASTRUCTURE

With human dimensions becoming increasingly crucial in the spatial analysis and modeling of cities and socio-economic systems, the physical institutions that employ, serve, and care for their inhabitants are no longer physical landmarks but archetypes of our deathcare ecosystem. Understanding that deathcare is conducted differently between provinces, the infrastructure of deathcare is documented at a smaller scale and across three levels.

1. Provincial - Deathcare infrastructure
2. Regional - Deathcare operations
3. Administrative - Deathcare facilities

The following sections detail the provincial policies and norms set in place for conducting death investigations, the regional approach between agencies and facilities as they provide services for the deceased and their communities, and the unique typologies and stakeholders that are found within each sector.

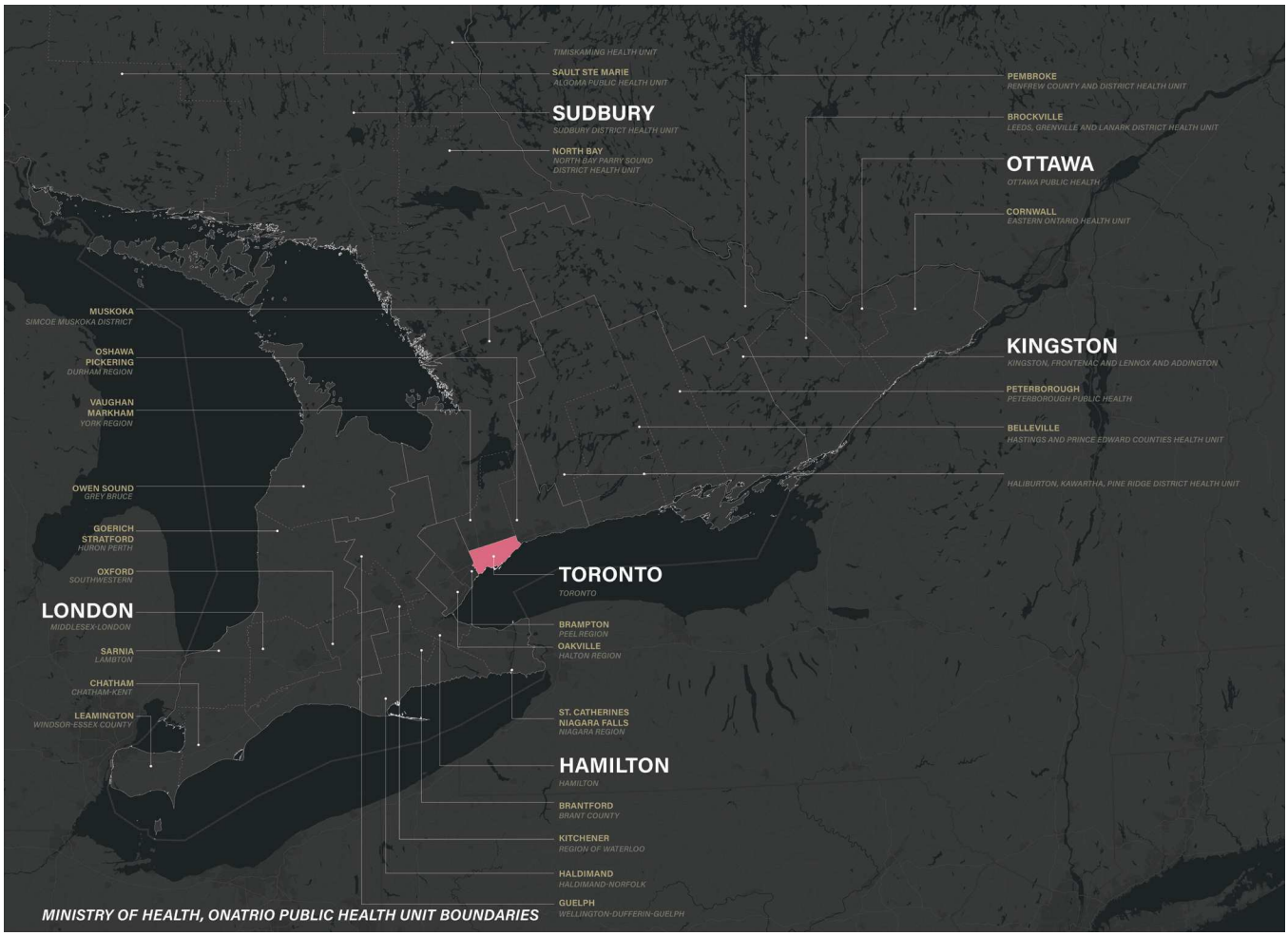


Fig 2-1 Map of forensic pathology units in Ontario and corresponding public health unit boundaries (shown in desaturated text)

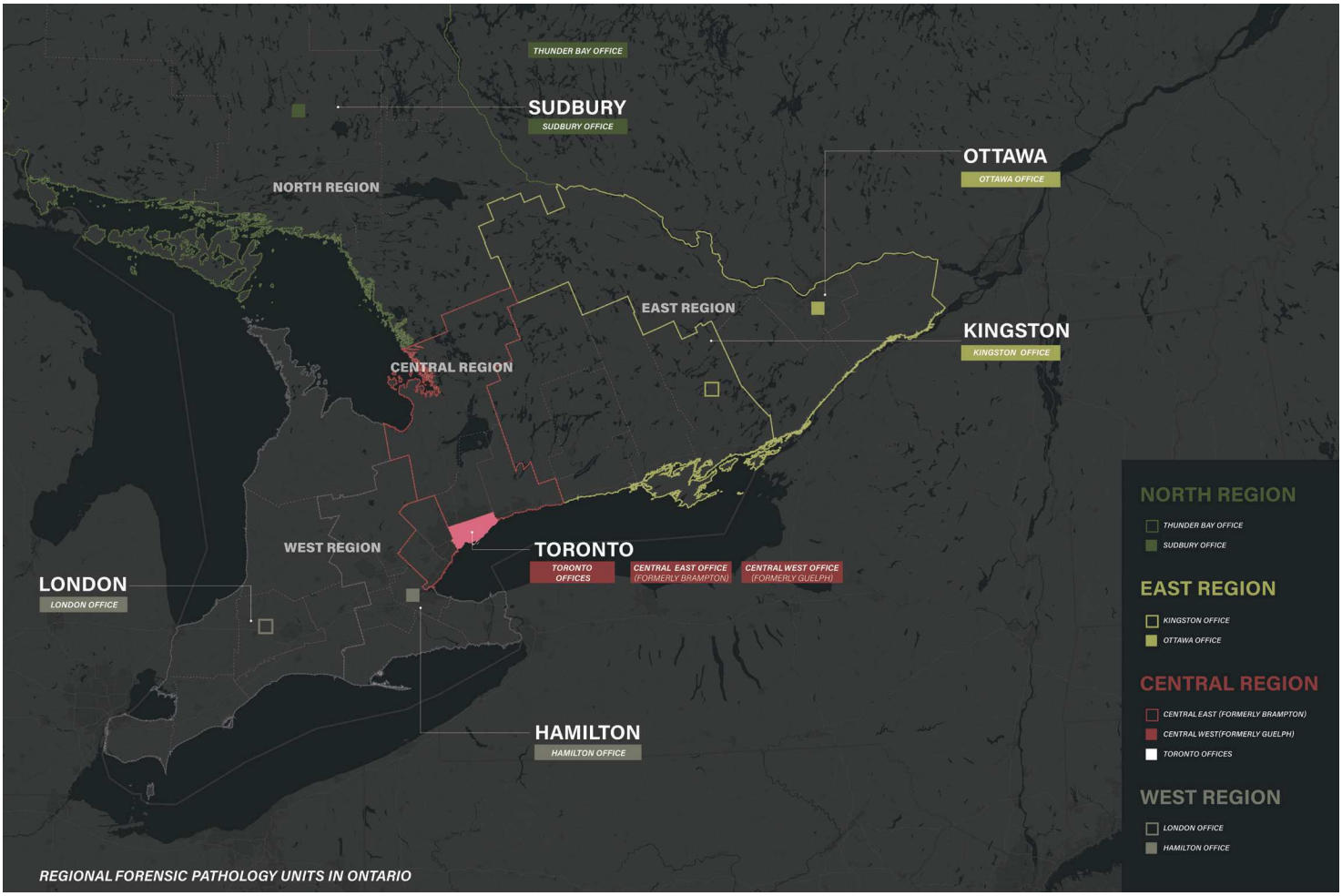


Fig 2-2 Map showing supervising regional FPU's within each region

ONTARIO CORONER'S ACT

In Ontario, processes in death investigations are governed by the Coroner's Act and conducted by the Office of the Chief Coroner and Ontario Forensic Pathology Service whom operate under the Act. While most deaths in Canada are caused by natural diseases previously diagnosed by a physician, unexplained or unexpected deaths must be reported to and investigated by a coroner or medical examiner. [13] When a sudden or unexpected death occurs, a coroner is called to conduct a death investigation and findings are used to answer the following five questions:

1. Who (identity of the deceased)
2. When (date of death)
3. Where (location of death)
4. How (medical cause of death)
5. By what means (natural causes, accident, homicide, suicide or undetermined)

13 *"Deaths, by Month; Frequency: Annual."* Deaths, by month. Statistics Canada, January 24, 2022. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310070801.

Fig 2-3 Map Showing Sequence of Events in Issuance of Death Certificates in Ontario

Communication within regions when reporting deaths to the regional coroners office (top) and issuance of death certificate and documentation from the Office of the Chief Coroner to corresponding supervising offices (bottom

Depending on the province, the percentage of deaths investigated can range from 7% to 45% annually. And while reporting criteria may differ between jurisdictions, natural diseases account to 61% of all coroner or medical examiner cases.[14] Case information is crucial not only in death investigations, but for researchers in understanding circumstances of injury or drug deaths. Should the coroner believe further examination is necessary to inform the death investigation, a pre-autopsy consultation is held between a regional supervising coroner and a forensic pathologist. Based on the case's complexity and local pathologists' skills, an appropriate location is determined, and arrangements are made to have the body transferred.

Five Manners of Death:

1. Natural: All deaths where a disease initiates the chain of events ending in death.
2. Accident: All deaths where an injury initiates the chain of events ending in death and there is no element of intent in the circumstances leading to the injury.
3. Suicide: All deaths where a self-inflicted injury initiates the chain of events ending in death and where the decedent intends to cause their own death.
4. Homicide: All deaths where an injury initiates the chain of events ending in death and there is evidence to indicate some intent on the part of another individual to cause harm.
5. Undetermined: All deaths where investigation is unable to attribute one of the previous manners are categorized as undetermined. Note that in such instances, the cause of death may be known.

14 *Leading Causes of Death."* Natural Diseases. Statistics Canada, n.d. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310039401.

REGISTRATION OF DEATH & DEATH CERTIFICATE

In most cases, death investigations are completed without a postmortem examination, and the family makes arrangements to have the body transported from the place of death to a bereavement facility. In the case of non-reportable deaths, the body of the deceased is evaluated by the attending physician. The funeral director and the deceased's body provide a Medical Certificate of Death. Details of the dead are submitted in the Statement of Death and completed by the informant, a family member, and the funeral director. To register a death, the Medical Certificate of Death and the Statement of Death are submitted to the local municipal clerk's office by the funeral director and cause of death information is gathered for medical and health research. Once all documents are submitted to the municipality, deaths should be registered within 12 weeks, and a death certificate may be available upon request. While funeral directors can issue copies of proof of death, some organizations may require an official copy. The family may require certified copies for a variety of reasons, such as:

- Settling an estate
- Insurance purposes
- Access to/termination of government services, for example, health care, pension, voters' list
- Genealogy research

While authorized representatives and next of kin may register online to obtain a certified copy, official death certificates from the Province of Ontario will not contain the cause of death information unless received in person or through the mail.[15] Processing times also vary where certified copies without a cause of death may be delivered in 5 business days and documents with a cause of death up to 6 to 8 weeks.

INQUESTS

Beyond these investigations, public "inquisitional" hearings may occur, otherwise known as an Inquest or Public Inquiry. Inquests fall into one of two types:

- Mandatory Inquest - required by law
- Discretionary Inquest- at the discretion of the coroner

Expert witnesses often include forensic pathologists, other consultants as well as other death investigation partners. At a typical hearing, an objective examination of facts is presented to a five-person jury, and at the conclusion, the jury often makes recommendations that may prevent further deaths. These recommendations are used to develop standardized protocols and more comprehensive guidelines in the current system. The overarching goal in deathcare is to provide care for the deceased and their families, and to leverage data collected to protect public health. Legal policies and processes outlined in the previous section demonstrate how this is made possible but would be impossible without the cooperation of agencies at the regional level.

15 *"Ontario Death Certificate."* Canada Certificates, August 2019. https://canadacertificates.com/death-ontario.html.

REGIONAL OPERATIONS IN DEATHCARE

While Ontario's Coroners Act dictates the unseen operations of the deathcare system, the institutions within the system are often visible yet unnoticed by the general public. These institutions have been categorized by their unique services, where three predominant work sectors are illustrated along with institutions that will be further discussed.

PATIENT CARE SECTOR

As practitioners predominantly interface with those with healthcare needs, units within the sector are divided by user groups and identified as either palliative care units or assisted living arrangements for the elderly. Although the patient care sector focuses on the needs of the living, it routinely interacts with the death investigation sector and the bereavement service sector. Therefore, to understand existing processes and identify pain points in the system, operations affecting patients with terminal illnesses or elderly requiring dedicated care have been included.

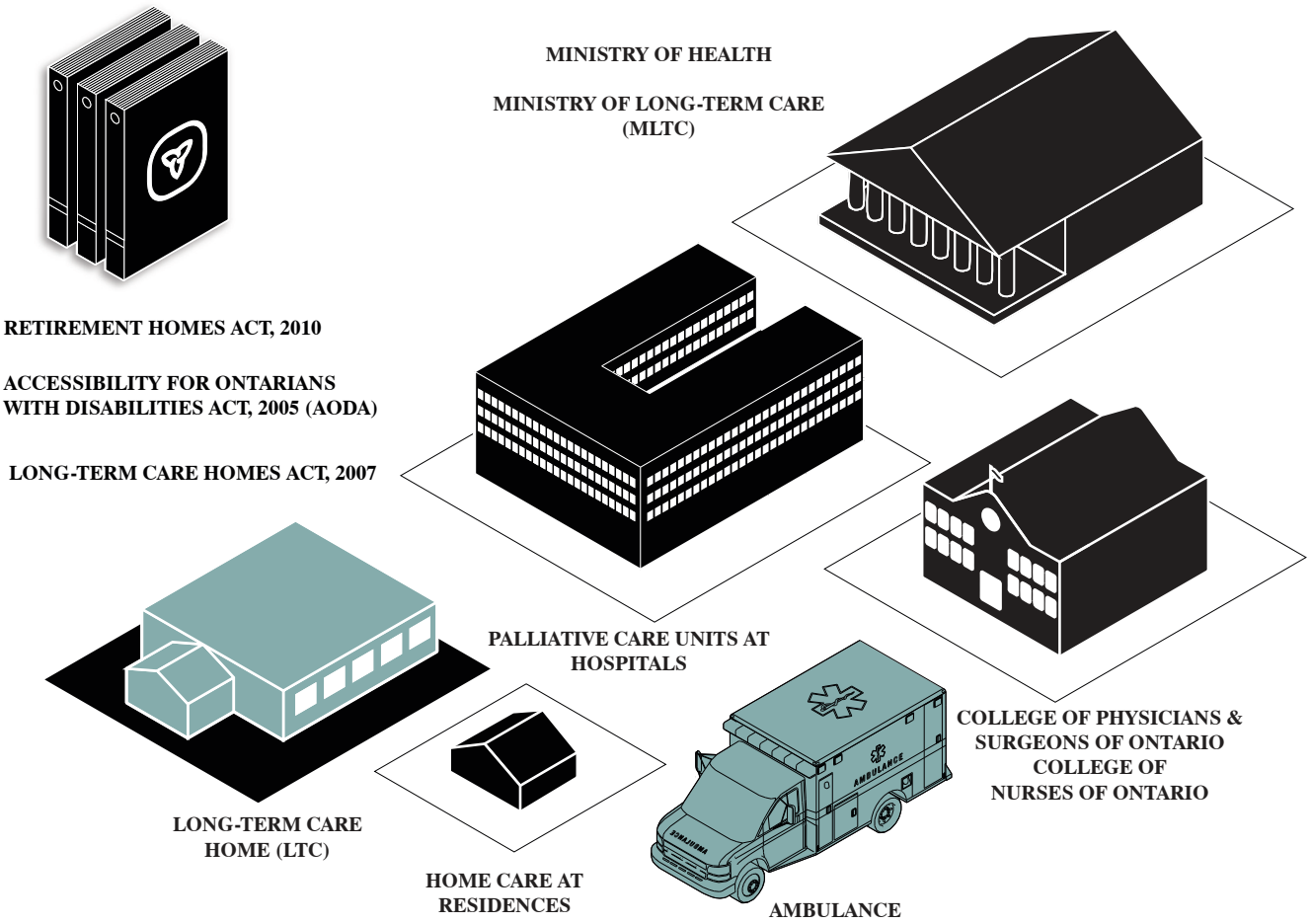


Fig 2-4 Diagram of key institutions, building typologies and public figures in the patient care sector

PALLIATIVE CARE SERVICES

Palliative care is specialized medical care for people living with terminal or debilitating symptoms, where services are focused on pain relief which includes physical, psychological, social or spiritual. As a key part of health care systems, palliative care is integrated within our medical institutions and while there are dedicated units in most institutions, there services are also available in residential hospices, long-term care homes or at home through their providers. As services can be offered throughout the course of illness from diagnosis to bereavement, figure x can be referenced to differentiate services between the three stages:

1. Palliative care
2. End-of-life care
3. Terminal care

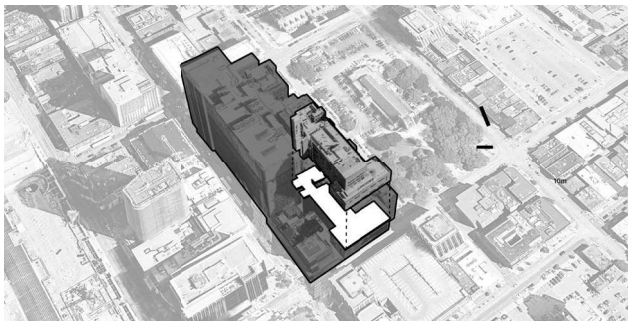
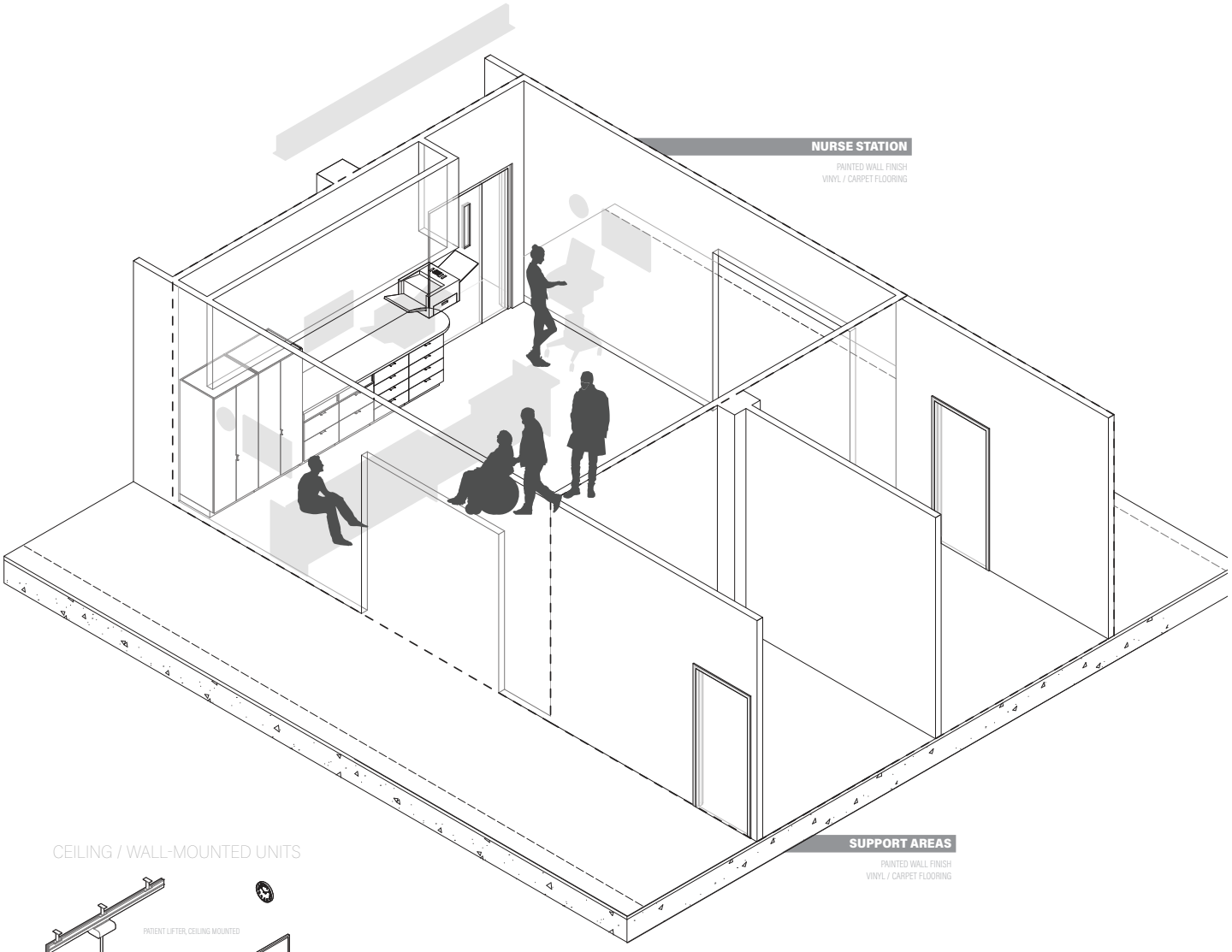


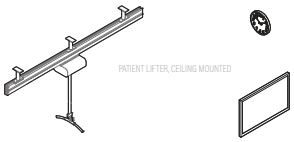
Fig 2-5 Perspective of St Michael's Hospital, Toronto, palliative care wing

Palliative care services are provided through the Ontario Palliative Care Network, and is partnership of community stakeholders that work on standardizing approach for delivering hospice palliative care services. As an initial plan created by practitioners and stakeholders in 2011, a formalized business plan was subsequently developed by the Local Health Integration Networks and Ontario Heath and the Network was launched by launched by the Ministry of Health and Long-Term Care in March 2016. [16]

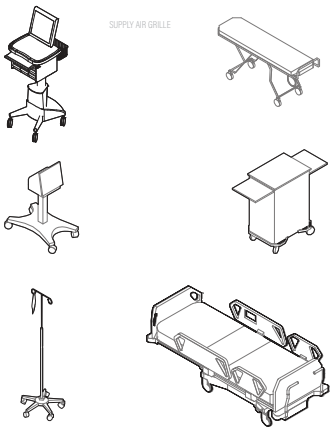
16 Sherar, Michael, and Bill MacLeod. "Inaugural Report 2016-17." Ontario Palliative Care Network, March 31, 2016. https://www.ontariopalliativecarenetwork.ca/sites/opcn/files/2021-02/Inaugural_Report_ENGLISH.pdf.



CEILING / WALL-MOUNTED UNITS



CLINICAL EQUIPMENT



CASEWORK

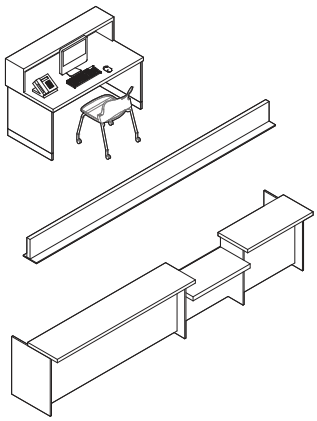
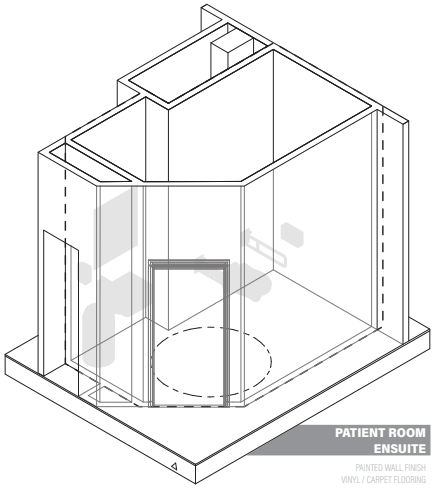
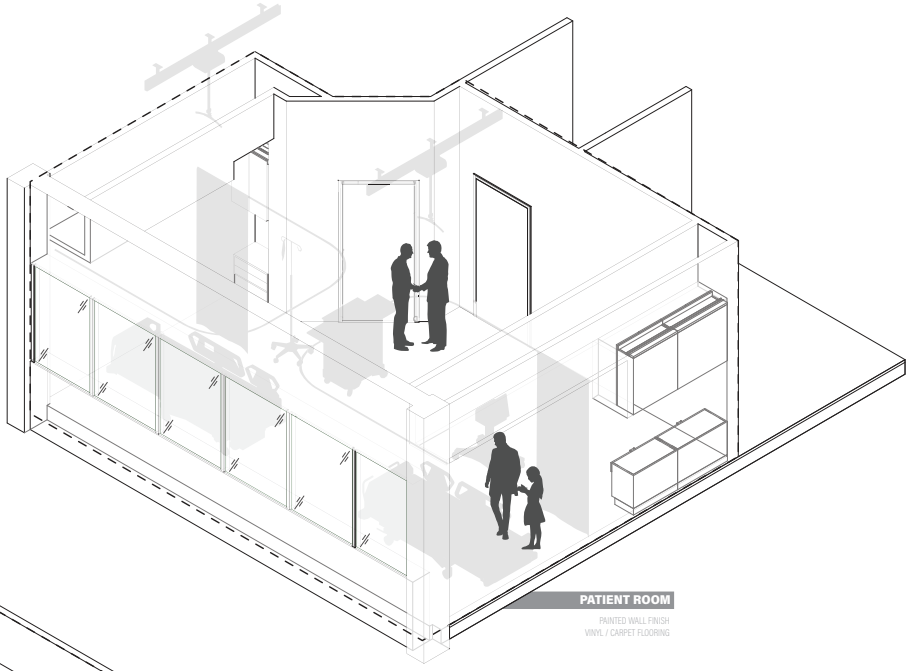


Fig 2-6 Isometric illustration of typical programs in a palliative care wing within a hospital (continued on next page)



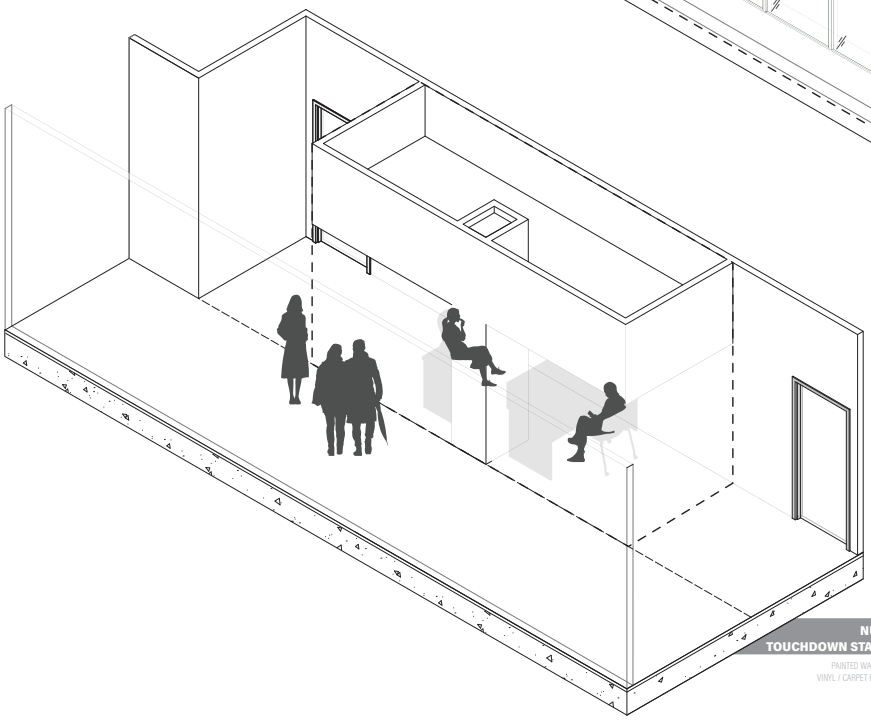
PATIENT ROOM ENSUITE

PAINTED WALL FINISH
VINYL / CARPET FLOORING



PATIENT ROOM

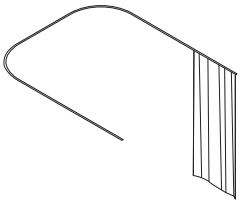
PAINTED WALL FINISH
VINYL / CARPET FLOORING



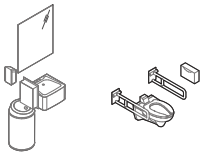
NURSE TOUCHDOWN STATION

PAINTED WALL FINISH
VINYL / CARPET FLOORING

SPECIALTY EQUIPMENT



PLUMBING FIXTURES



LONG-TERM CARE

Assisted living arrangements such as long-term care homes (LTC) are also called nursing homes, personal care homes, residential care facilities, lodges, assisted living facilities and supportive housing. These units provide health and personal care services for Canadian seniors and depend on their medical or physical needs. While LTC provides 24 hour nursing care, alternates for congregate living such as assisted living, supportive housing and retirement homes are not public funded and are dedicated for more independent individuals. For the purpose of analyzing factors affecting deathcare, LTC homes focused on complex health needs will be used in reviewing seniors in congregate living facilities.

While the proportion of private and publicly owned LTC homes vary by Canadian jurisdiction, overall 54% of LTC homes are privately owned in Canada, with 84% being privately owned in Ontario. [17]Operators for these facilities are regulated under the Fixing Long-Term Care Act and must have a license to operate under. As LTC homes offer different levels of care, units may be free-standing or co-located with other types of care or hospitals.

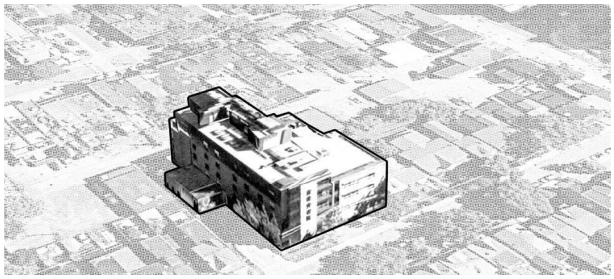


Fig 2-7 Perspective of Mon Sheung Long-Term Care Home located in Toronto, Ontario

Fig 2-8Perspective of Kensington Palliative Care Hospice located in Toronto, Ontario

17 *"Long-Term Care Homes in Canada: How Many and Who Owns Them?"* Canadian Institute for Health Information, June 10, 2021. https://www.cihi.ca/en/long-term-care-homes-in-canada-how-many-and-who-owns-them.

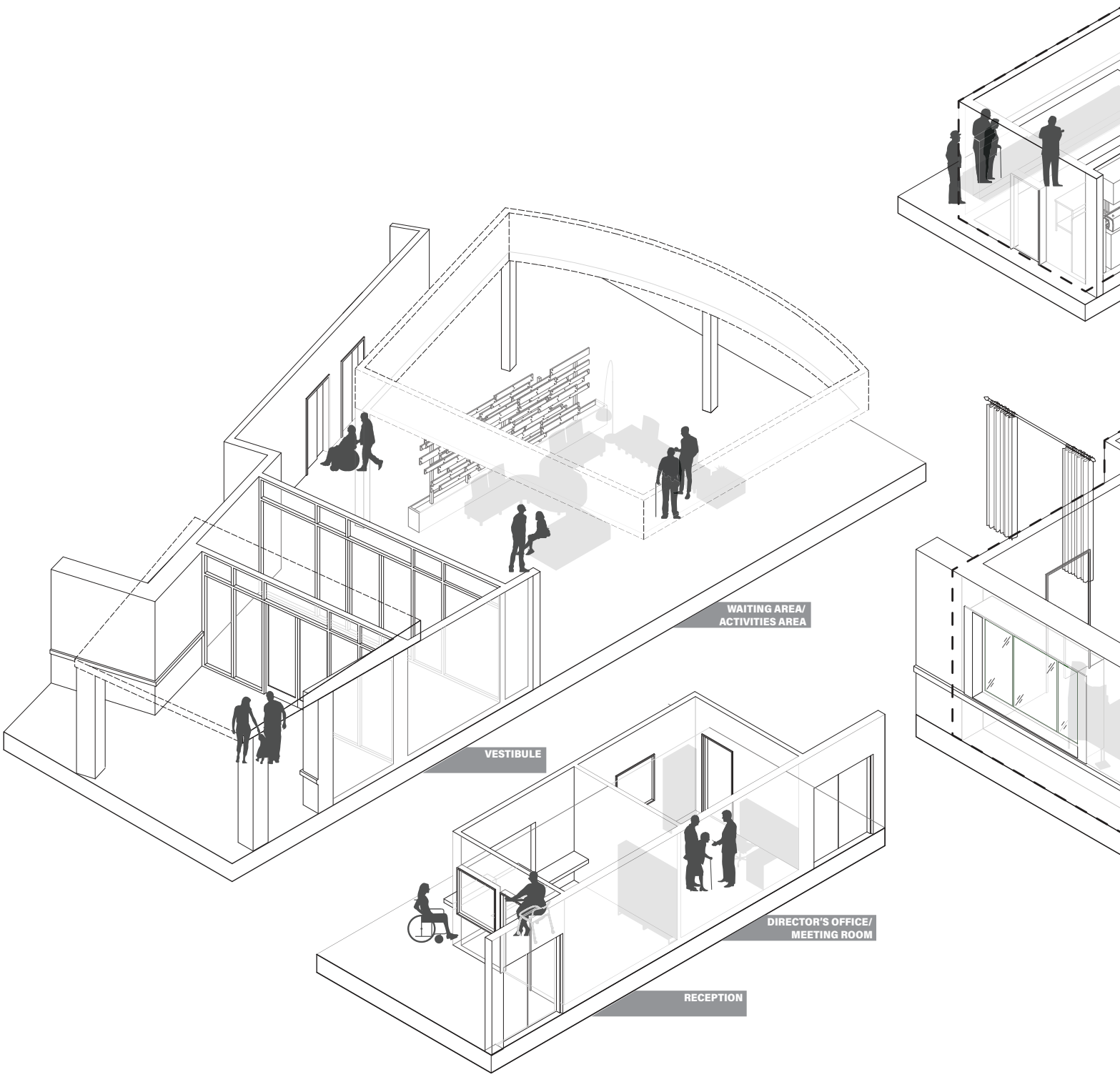
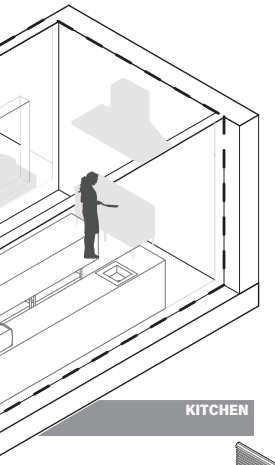
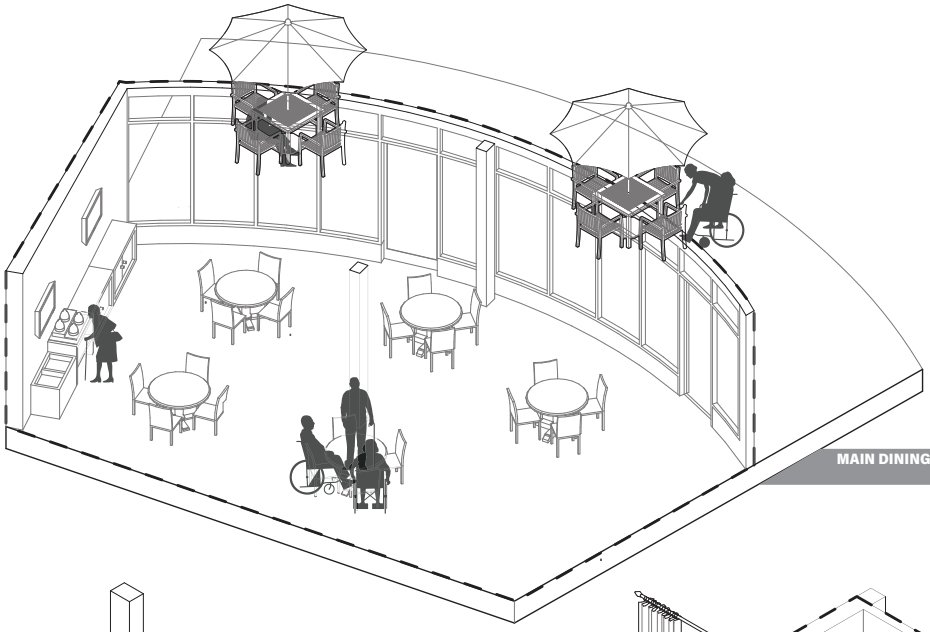


Fig 2-9 Isonometric illustration of typical programs in a long-term care home



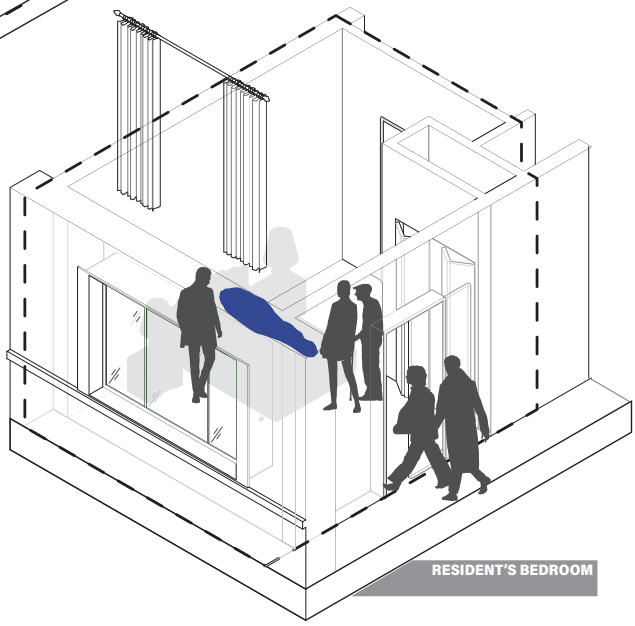
KITCHEN



MAIN DINING HALL

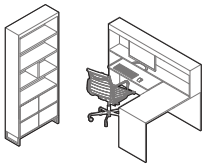
PATIENT ROOM ENSUITE

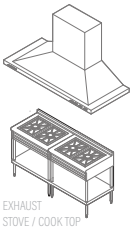
PAINTED WALL FINISH
VINYL / CARPET FLOORING



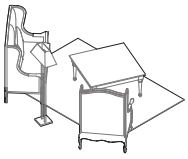
RESIDENT'S BEDROOM

FILING CABINET/ SHELVES
WORKSTATION

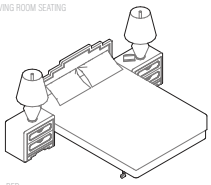




EXHAUST
STOVE / COOK TOP

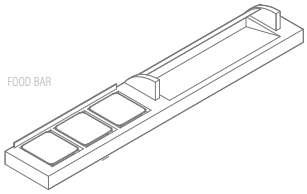


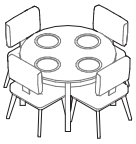
LIVING ROOM SEATING



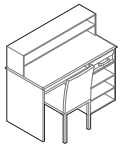
BED

FOOD BAR



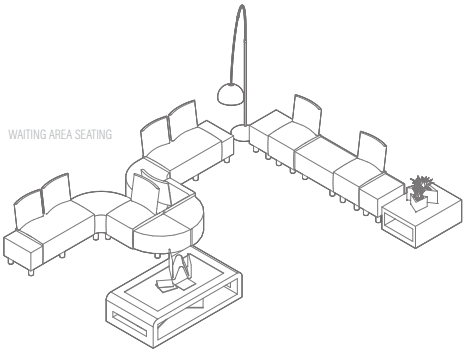


DINING TABLE



CREDENZA

WAITING AREA SEATING



DEATH INVESTIGATION SECTOR

Suspicious or sudden deaths are reported to regional coroner's offices that are managed by the Office of the Chief Coroner (OCC). As appointed officials, coroners conduct death investigations to ensure that no death is overlooked, concealed or ignored.

Coroners Offices regions and offices:

- North Region
- West Region
- East Region

Central Region The office determines the identity of the deceased and cause of death, and are responsible in classifying the manner of death as natural, accidental, homicide, suicide, or undetermined. Jurisdictions of offices have been divided across four regions, with each region supported by contract physicians, local coroners offices and a regional supervising coroners office.

DEATH INVESTIGATION & INQUESTS

The Office operates under the Coroner's Act and Anatomy Act and is part of the Ministry of the Solicitor General and the Ontario Forensic Pathology Service (OFPS). While coroners are assisted by the RCMP, those considered suspicious or foul play is apparent, the RCMP will lead a criminal investigation, in which case will be assisted by the OCC. In such cases, a coroner issues a warrant for possession of the body and determines the need for a medical investigation with the OFPS. Following the investigation, coroners may hold an inquest. While no one is on trial at an inquest, witnesses may be summoned to testify about their knowledge of involvement and the presiding coroners and jurors may ask questions of witnesses. The goal of the inquest is to present facts relating to the circumstances of the death in a fair manner, where verdicts of the jury may be used to bring dangerous conditions to public knowledge and to develop guidelines to prevent further deaths.

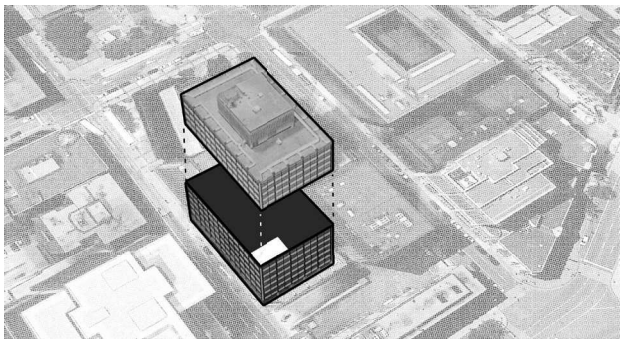


Fig 2-10 Perspective of the Regional Coroner's Office in Ottawa

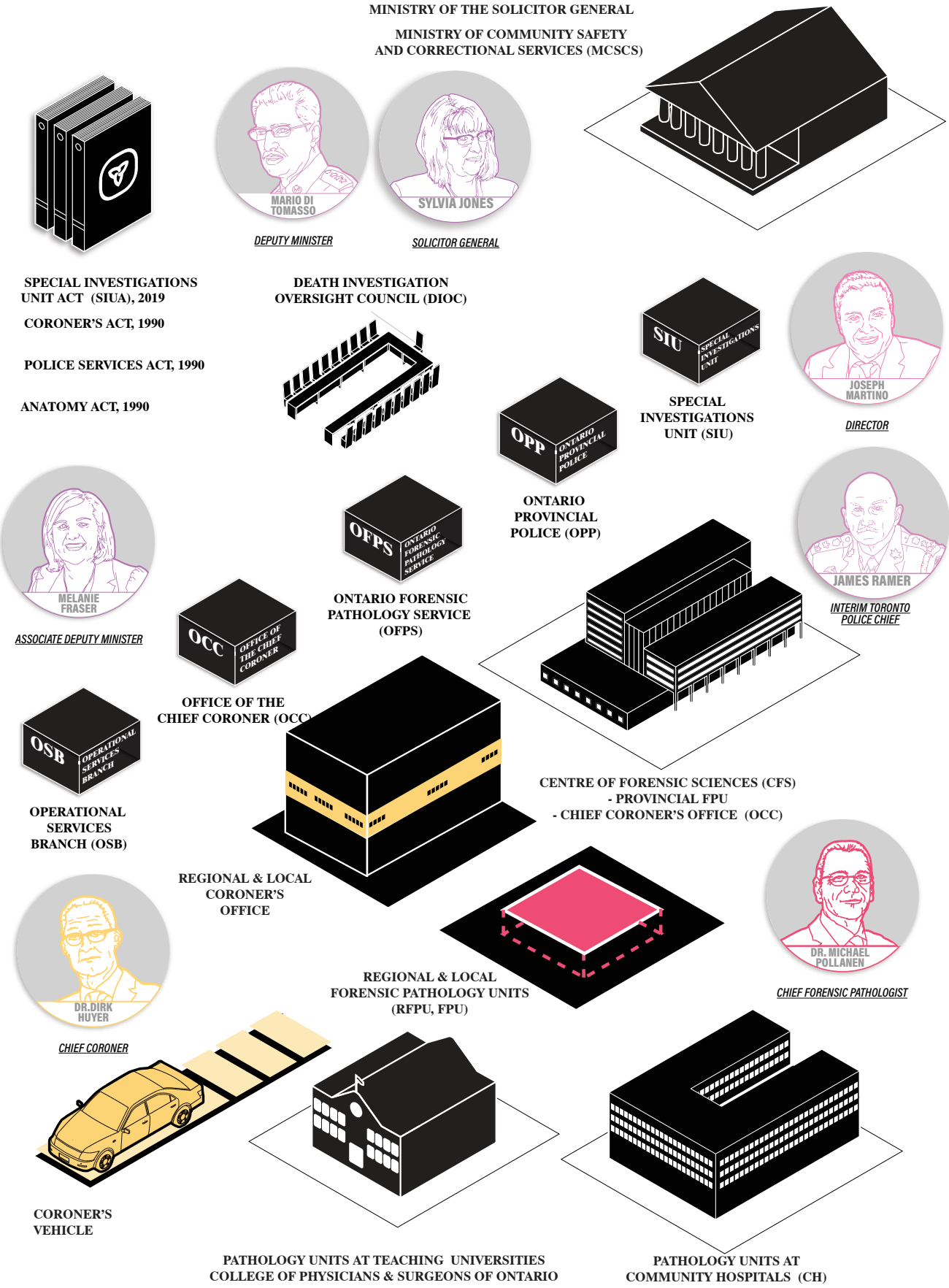


Fig 2-11 Diagram of key institutions , building typologies and public figures in the death investigation sector

AUTOPSY AND FORENSIC PATHOLOGY

And as an accredited sub-specialty of pathology, Forensic pathologists are experts in disease and injury and are likely board certified in their field. While they routinely interact, a coroner specializes in the legal and law enforcement aspect of death, whereas pathologists or medical examiners specialize in the medical side. Medical examinations such as autopsies and other tests are provided across the province and are assigned according to unit capabilities and case complexities under the Coroner's Act.

The Ontario Forensic Pathology Service (OFPS) provides forensic pathology services through Forensic Pathology Units (FPUs) located in university teaching hospitals. FPUs are largely in charge of routine cases and receive help from forensic pathology units or pathologists at Community Hospitals on an as-needed basis, . More complex cases are handled by the Provincial Forensic Pathology Unit (PFPU) located in the Ontario Forensic Sciences Centre, which includes pediatric or suspicious cases. Major partners include the OCC, police agencies, the Office of the Fire Marshal and Emergency Management, the Special Investigations Unit, the Centre of Forensic Sciences, as well as the province's criminal justice system.

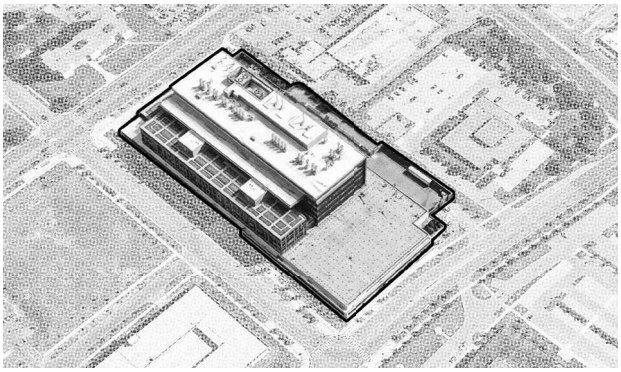


Fig 2-12 Perspective of the Forensic Pathology Unit in Ottawa

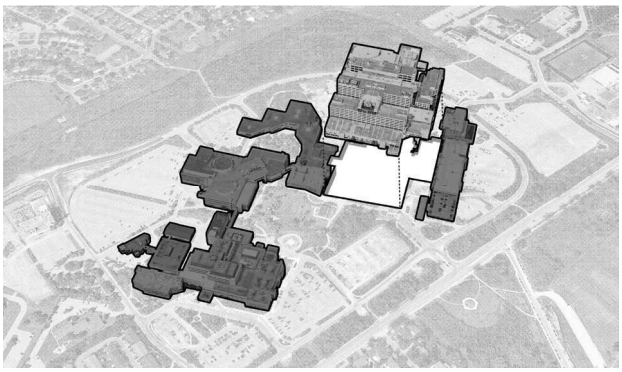


Fig 2-13 Perspective of the Ottawa FPU located at the Ottawa General Hospital

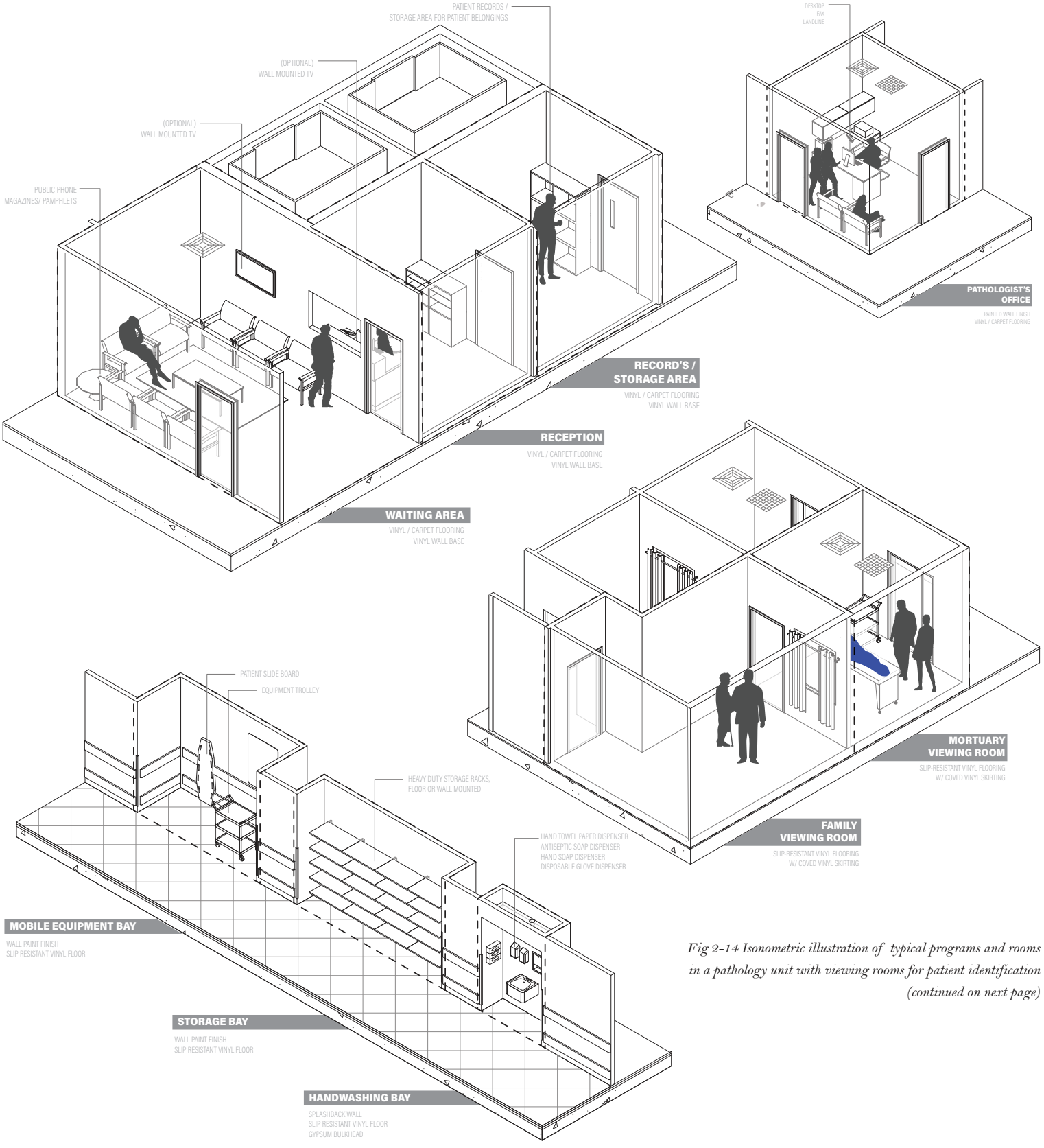
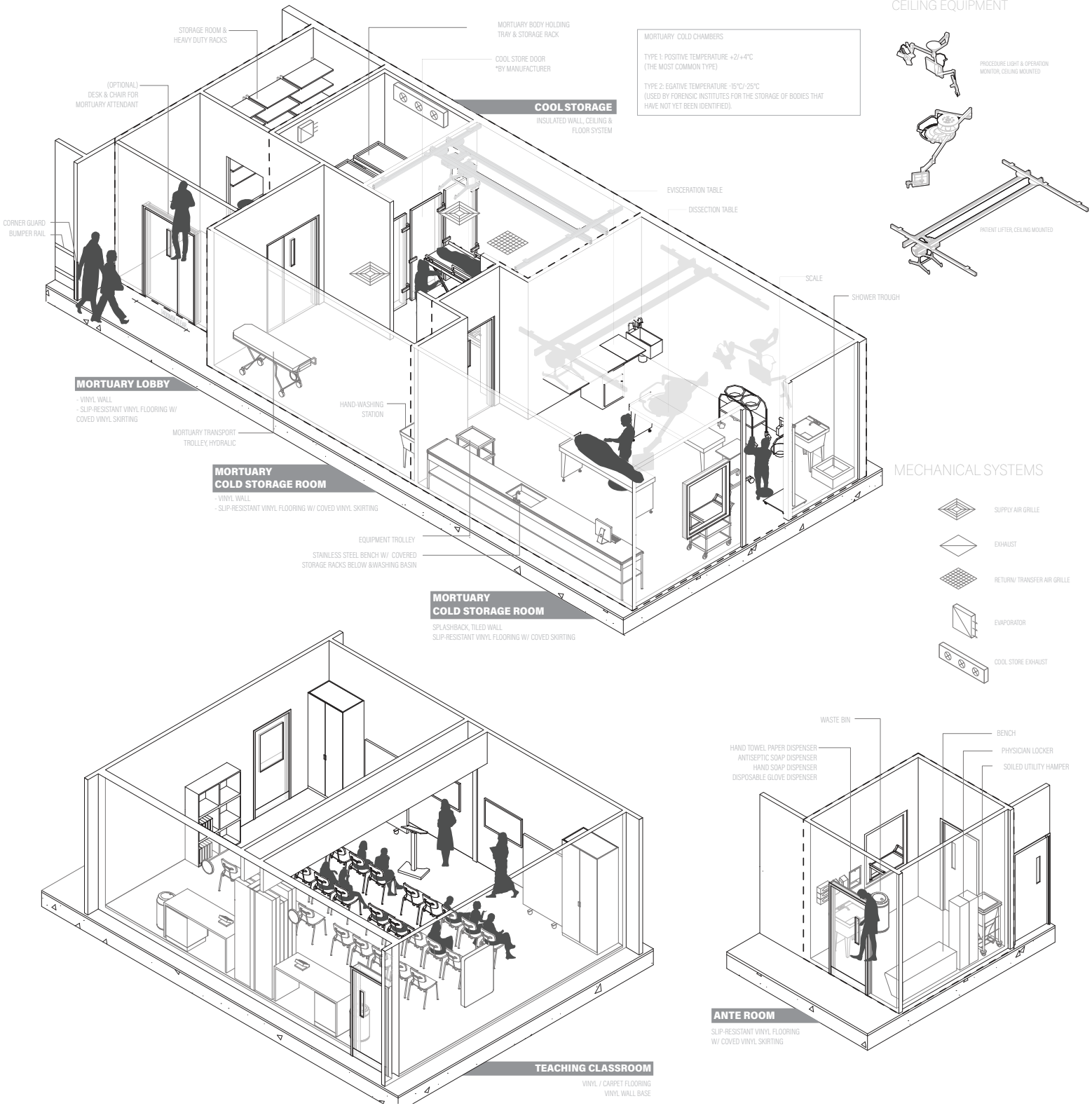


Fig 2-14 Isonometric illustration of typical programs and rooms in a pathology unit with viewing rooms for patient identification

(continued on next page)


STORAGE ROOM &
HEAVY DUTY RACKS
MORTUARY BODY HOLDING
TRAY & STORAGE RACK
COOL STORE DOOR
*BY MANUFACTURER
(OPTIONAL)
DESK & CHAIR FOR
MORTUARY ATTENDANT
COOL STORAGE
INSULATED WALL, CEILING &
FLOOR SYSTEM
MORTUARY COLD CHAMBERS
TYPE 1: POSITIVE TEMPERATURE +2/+4°C
(THE MOST COMMON TYPE)
TYPE 2: EGATIVE TEMPERATURE -15°C/-25°C
(USED BY FORENSIC INSTITUTES FOR THE STORAGE OF BODIES THAT
HAVE NOT YET BEEN IDENTIFIED).
CEILING EQUIPMENT
PROCEDURE LIGHT & OPERATION
MONITOR, CEILING MOUNTED
PATIENT LIFTER, CEILING MOUNTED
EVISCERATION TABLE
DISSECTION TABLE
SCALE
SHOWER TROUGH
CORNER GUARD
BUMPER RAIL
MORTUARY LOBBY
- VINYL WALL
- SLIP-RESISTANT VINYL FLOORING W/
COVED VINYL SKIRTING
HAND-WASHING
STATION
MORTUARY TRANSPORT
TROLLEY, HYDRAULIC
MORTUARY
COLD STORAGE ROOM
- VINYL WALL
- SLIP-RESISTANT VINYL FLOORING W/ COVED VINYL SKIRTING
EQUIPMENT TROLLEY
STAINLESS STEEL BENCH W/ COVERED
STORAGE RACKS BELOW &WASHING BASIN
MORTUARY
COLD STORAGE ROOM
SPLASHBACK, TILED WALL
SLIP-RESISTANT VINYL FLOORING W/ COVED SKIRTING
MECHANICAL SYSTEMS
SUPPLY AIR GRILLE
EXHAUST
RETURN/ TRANSFER AIR GRILLE
EVAPORATOR
COOL STORE EXHAUST
WASTE BIN
BENCH
HAND TOWEL PAPER DISPENSER
ANTISEPTIC SOAP DISPENSER
HAND SOAP DISPENSER
DISPOSABLE GLOVE DISPENSER
PHYSICIAN LOCKER
SOILED UTILITY HAMPER
ANTE ROOM
SLIP-RESISTANT VINYL FLOORING
W/ COVED VINYL SKIRTING
TEACHING CLASSROOM
VINYL / CARPET FLOORING
VINYL WALL BASE

BEREAVEMENT SERVICES

Operators for funeral homes provide transfer services for the deceased and help families arrange preparations for bereavements services. As a provider for consumer services, operators and facilities are governed by the Bereavement Authority of Ontario, a government delegated authority that monitors their compliance with the law - the Funeral, Burial and Cremation Services Act (FBCSA). The BAO operates on behalf of the Ministry of Government and Consumer Services and is responsible for protecting public interest, regulating establishments, and the licensing of facilities and practitioners.

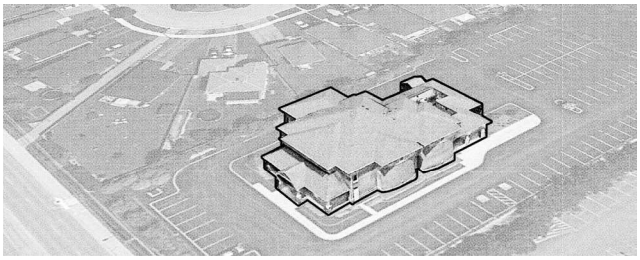


Fig 2-15 Perspective of Adam's Funeral home located in Barrie, Ontario

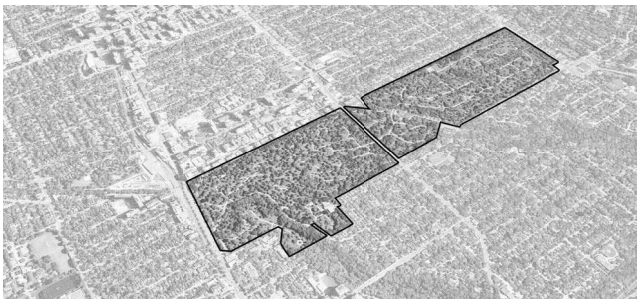


Fig 2-16 Perspective of Mount Pleasant Cemetery located in Toronto

In 2012, the bereavement sector witnessed its first major shift with the passing of Ontario's Funeral, Burial and Cremation Services Act. [18] By passing the law, the sector witnessed an unprecedented consolidation in the bereavement service industry where operators could combine funeral homes, crematoriums and cemeteries under one banner. These services and licensed operators can be referenced from Fig 2-17

18 *"Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c. 33."* LAWS, June 1, 2021. https://www.ontario.ca/laws/statute/02f33.

Description of Service Service Provider	Service Provider Funeral Establishment	Transfer Service	Cemetery	Crematorium or Hydrolysis	Family of Deceased
Removing the body from the place of death	✓	✓			✓
Placing the body in a casket and delivering it to a cemetery or crematorium Registering the death	✓	✓			✓
Registering the death	✓	✓			✓
Arranging to transport the body of the deceased out of Ontario	✓	✓			✓
Wash and dress the body	✓	✓			✓
Transport the body to or from a place of worship	✓	✓			✓
Hosting memorial services, celebrations of life and receptions including the rental of facilities (no body or cremated remains present)	Can be hosted by anyone				
Coordinating religious and non-religious funeral services or receptions including the rental of facilities (with the body or cremated remains present)	✓				✓
Embalming	✓				
Providing caskets, urns, vaults and flowers	✓		✓	✓	✓
Providing in-ground graves			✓		
Providing crypts in a mausoleum			✓		
Providing niches in a columbarium			✓		
Providing monuments	✓	✓	✓	✓	
Providing places to scatter cremated remains			✓		
Providing openings and closings of graves, niches or crypts			✓		
Conducting cremation or alkaline hydrolysis				✓	
Providing viewing of cremation				✓	

Fig 2-17 List of bereavement services available in Onatrio and their qualified providers

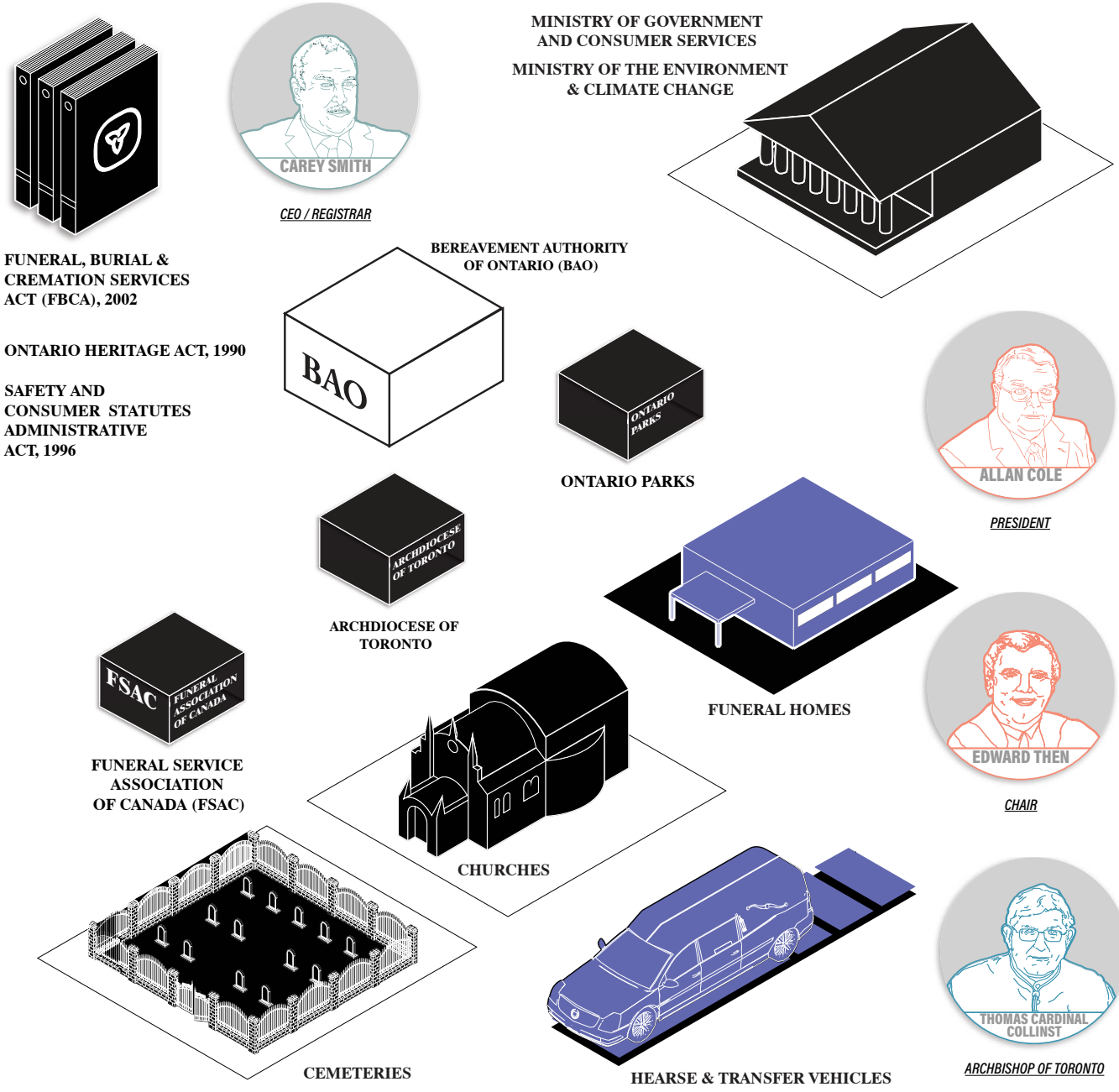
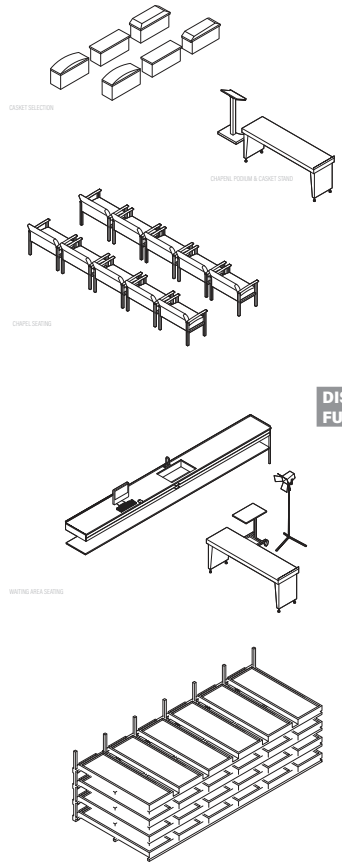
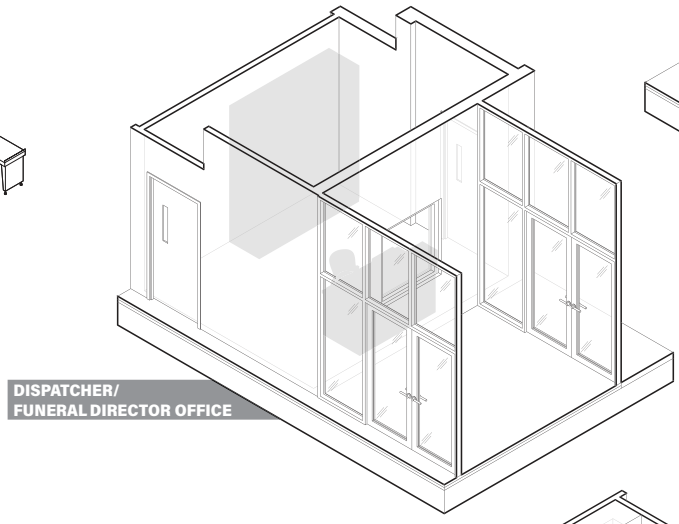
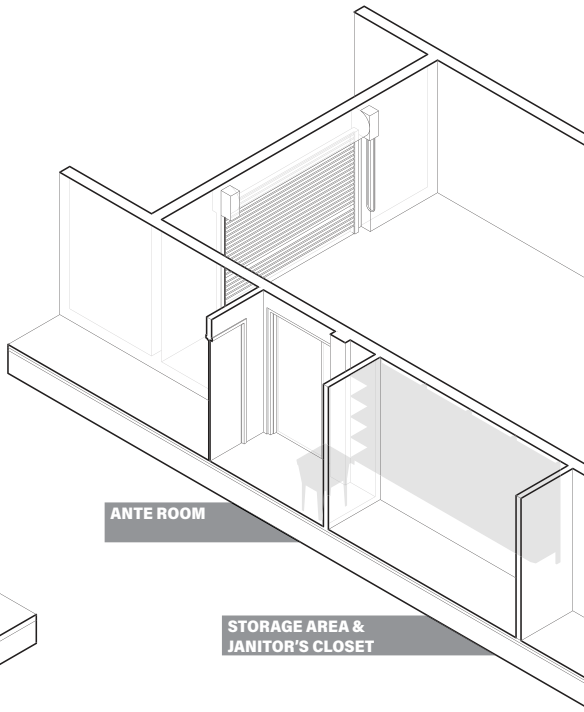
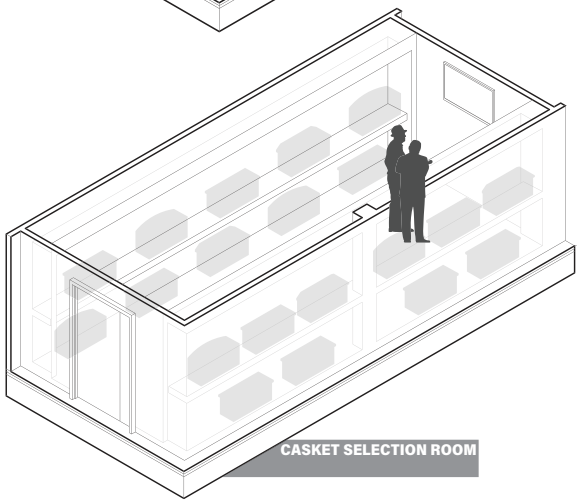


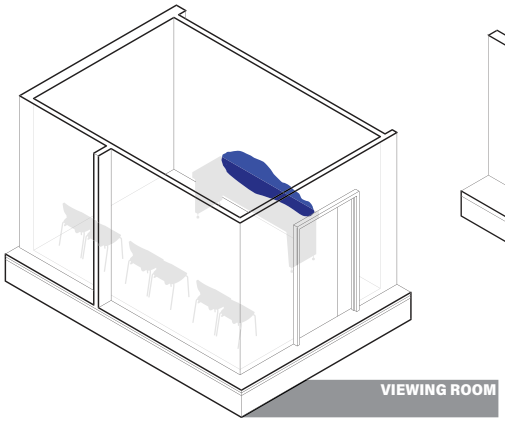
Fig 2-18 Diagram of building typologies and public figures in the dbereavement sector











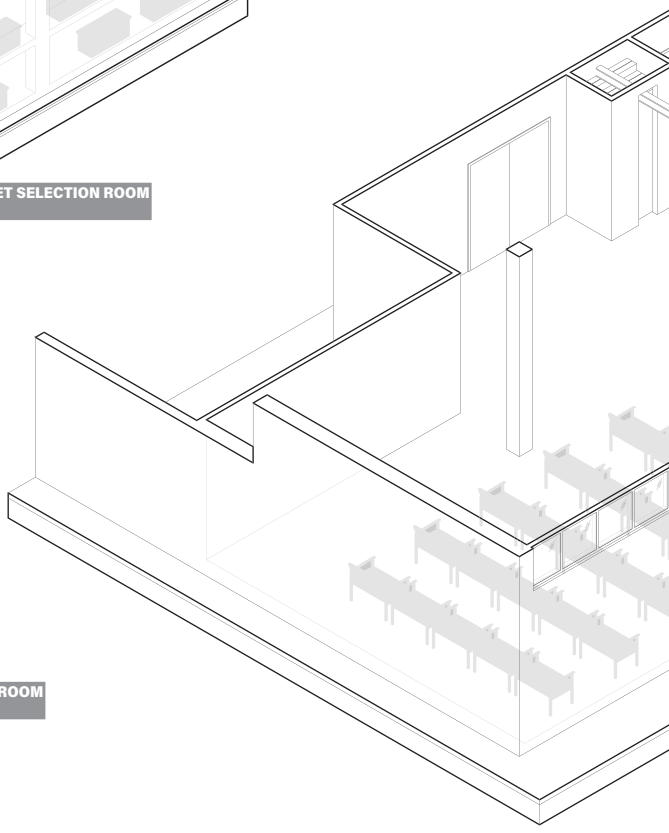
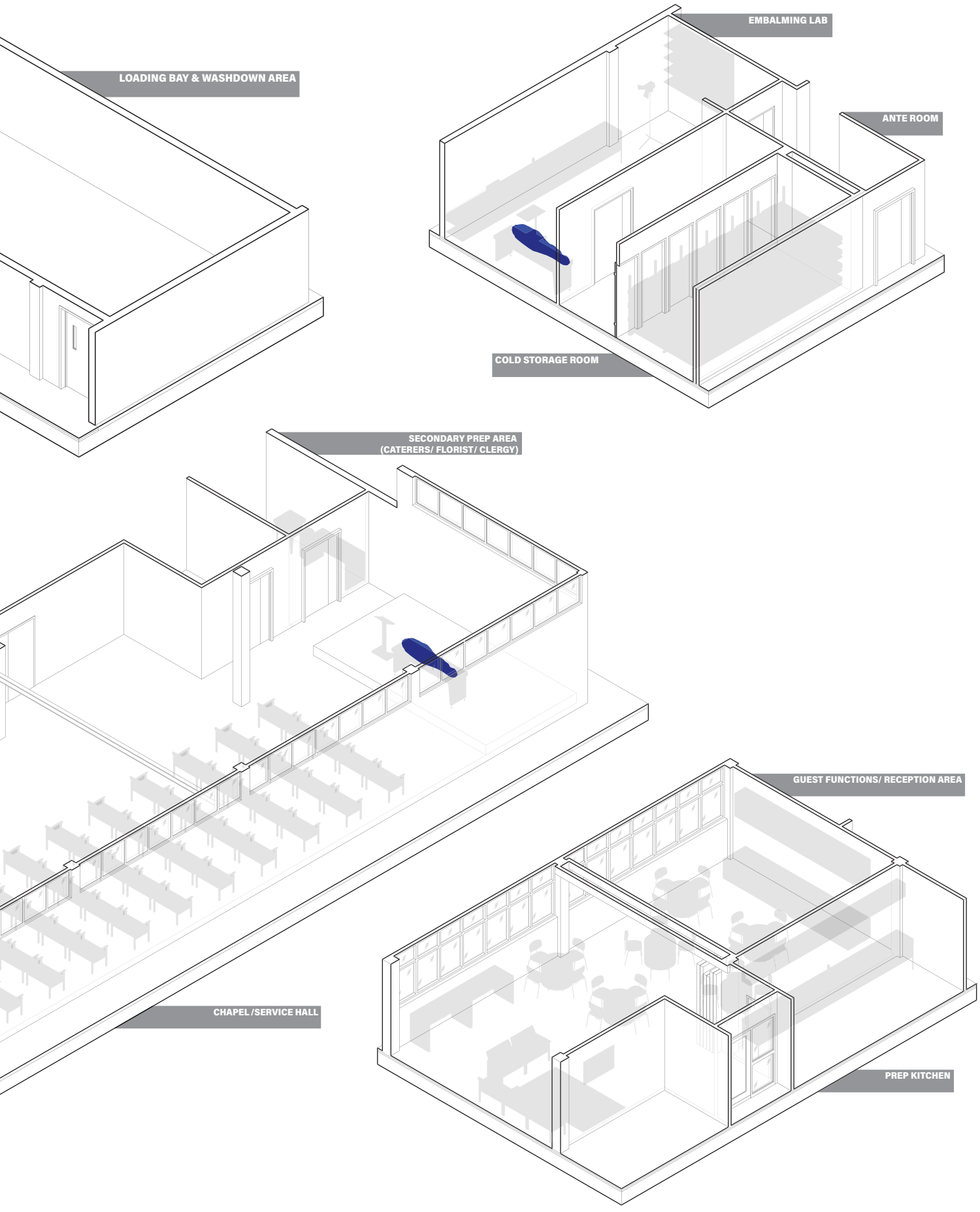


Fig 2-20 Isonometric illustration of typical programs and rooms in a funeral home


LOADING BAY & WASHDOWN AREA
EMBALMING LAB
ANTE ROOM
COLD STORAGE ROOM
SECONDARY PREP AREA
(CATERERS/ FLORIST/ CLERGY)
CHAPEL /SERVICE HALL
GUEST FUNCTIONS/ RECEPTION AREA
PREP KITCHEN

UNSEEN OPERATIONS

While the determination of a reportable or non-reportable death is unique to each case, the journey of bodies is typically dependent on the location the death is reported and how much is known about the deceased. The three main scenarios are: death in a care facility, death at home and death in the community

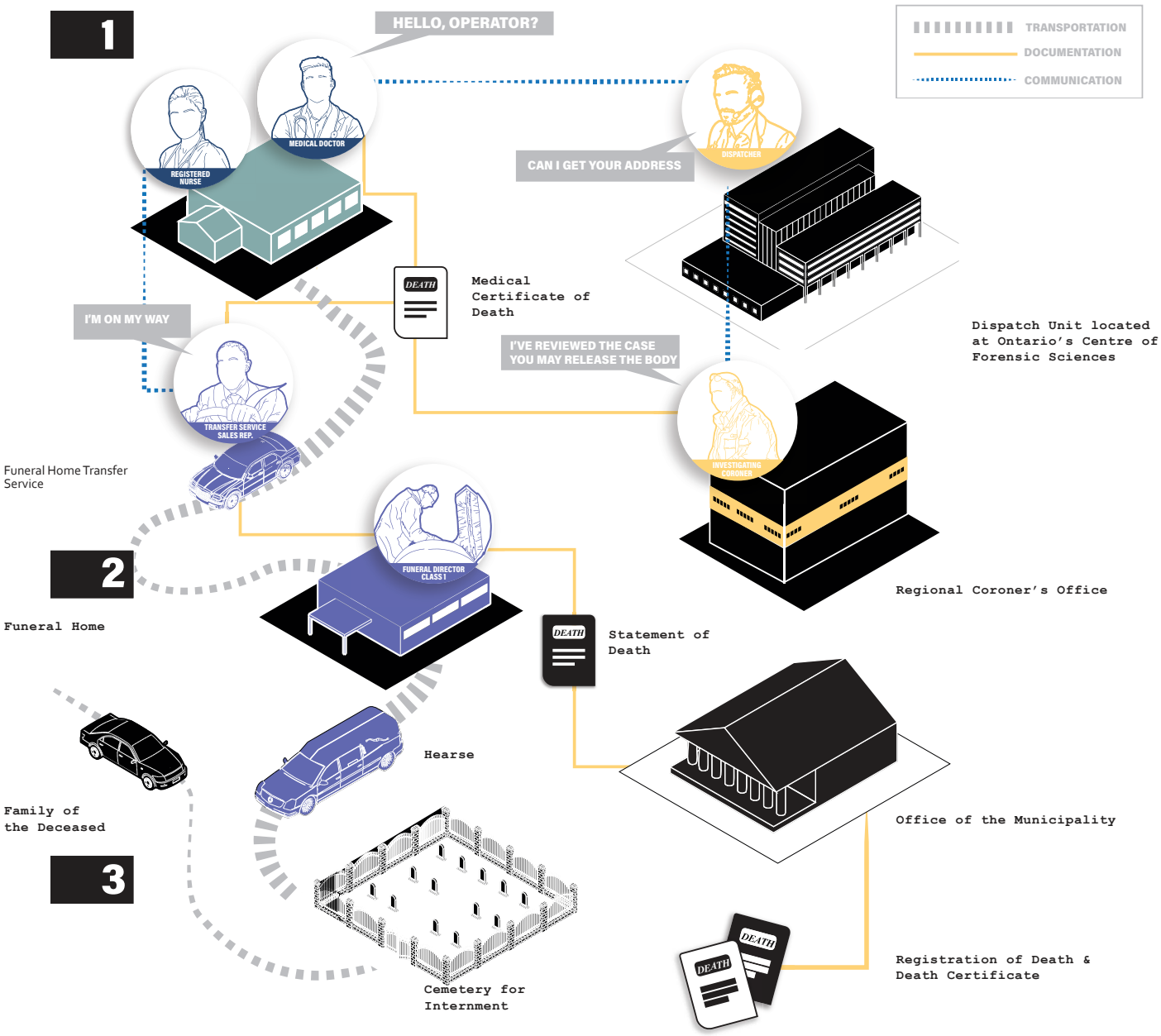


Fig 2-21 Diagram of body movement and system processess when death is reported at a long-term care home

Scenario 1: Death at Home
Staff in the long-term care home or attending physcian in the patients lodgings report to the dispatch operator at the regional Coroner's office. The assigned coroner reviews details surrounding the circumstance of death and issues a Medica Certificate of Death

SCENARIO 1: DEATH AT HOME

When the family reports a death at home, emergency response operators notify the coroner's office and an emergency response team is dispatched to the address. Details regarding the end are provided to the coroner, and an evaluation is made on whether their presence is needed. In most instances, the coroner may have the attending medical officer, part of the first responders, assess the body and submit a Medical Certificate of Death upon determination of the cause of death. After the family is informed, the funeral home director is notified, and a transfer team is dispatched to the residence. For reportable cases, a coroner's presence may be required, and in consultation with a forensic pathologist, the home may be evacuated and the body transported to a nearby medical facility. In the instance of a patient living in a long-term care home, the reporting process is done by an attending physician and details surrounding the death are reported to the dispatch office. (See Fig. 2-21) As deaths of elderly patients are often due to natural causes, they do not warrant a death investigation and the body is released to the funeral home for body preparation.

SCENARIO 2: DEATH IN A CARE FACILITY

When a caregiver reports a death in a hospital, retirement home or long-term care setting, cases are often categorized as non-reportable due to the deceased's medical history. An attending physician evaluates the body and issues a Medical Certificate of Death. (See Fig.2-22) The body is collected by the funeral staff or moved to the hospital morgue to await transfer staff. To finalize the death registration, the funeral director completes the Statement of Death detailing the deceased's identity and submits the two forms to the municipality. At the funeral home, the body is prepared for internment depending on the final disposition chosen by the family. It is placed in a cold storage unit until retrieved for service. In the instance of suspected neglect, foul play or need for medical research, a coroner may transfer the body to a forensic pathology unit to have additional examinations conducted by a forensic pathologist. Before an autopsy, the corner on duty is responsible for contacting the family regarding concerns about performing an autopsy and notifying their regional Coroner's Office. The supervising coroner consults with forensic pathologists, and a facility is chosen for conducting the examination. Upon determining the cause of death, the attending physician completes a medical report detailing the autopsy findings and reviews by the Chief Coroner. The coroner assigned to the case notified the family and the funeral home. The body is temporarily stored until it is collected, along with a Medical Certificate of Death.

SCENARIO 3: DEATH IN THE COMMUNITY

Where a victim is reported in the community either by an acquaintance or a passerby, emergency response operators notify the closest responding unit and the Office of the Chief Coroner. The attending officers are responsible for securing the scene and locating the next of kin if the deceased's identity is unknown. At this stage, the coroner assigned to the case evaluates the body and determines whether an autopsy is required and if the victim's physical state is fit for transfer. In consultation with a forensic pathologist, the examination's complexity will dictate the chosen facility, either a community hospital, pathology unit or the Center of Forensic Sciences. Upon identification of the deceased, a member of the Death Investigation Unit, either the coroner or the supervising officer, contacts the next of kin and the victims' physician. Details of the victim are collected and reviewed in conjunction with medical findings. If a cause of death is determined, the body is placed in temporary storage until collection by the family or a designated funeral operator.

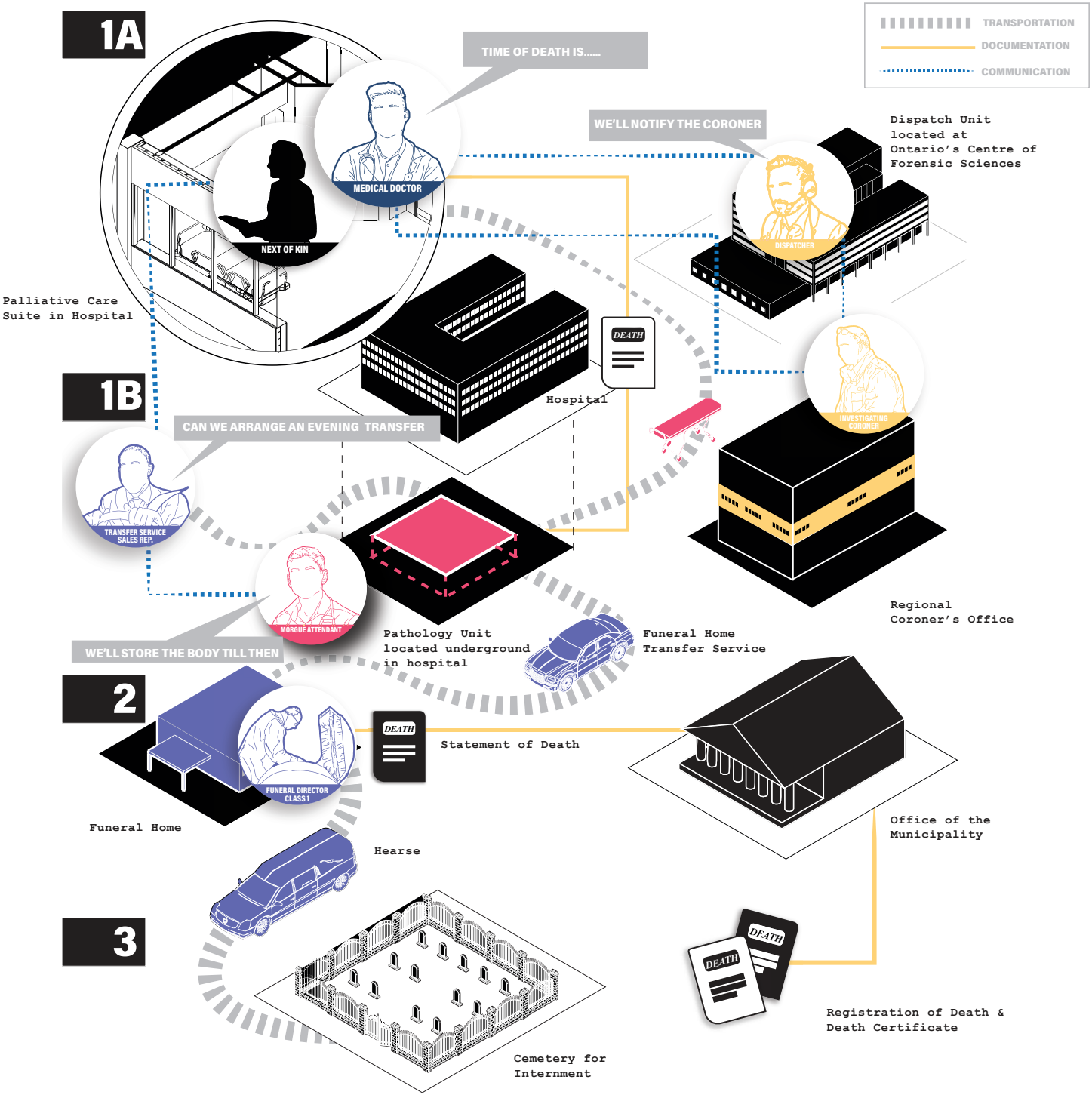


Fig 2-22 Diaram of body movement and system processess when death is reported at a hospital

Scenario 2: Death in a care facility
The attending physician is responsible for notifying the dispatch office, the next of kin if they are not present, as well as the funeral home. In this scenario, the body of the deceased is moved to the hospital morgue for temporary storage until a transfer service can be arranged to have this body transported to the funeral home.

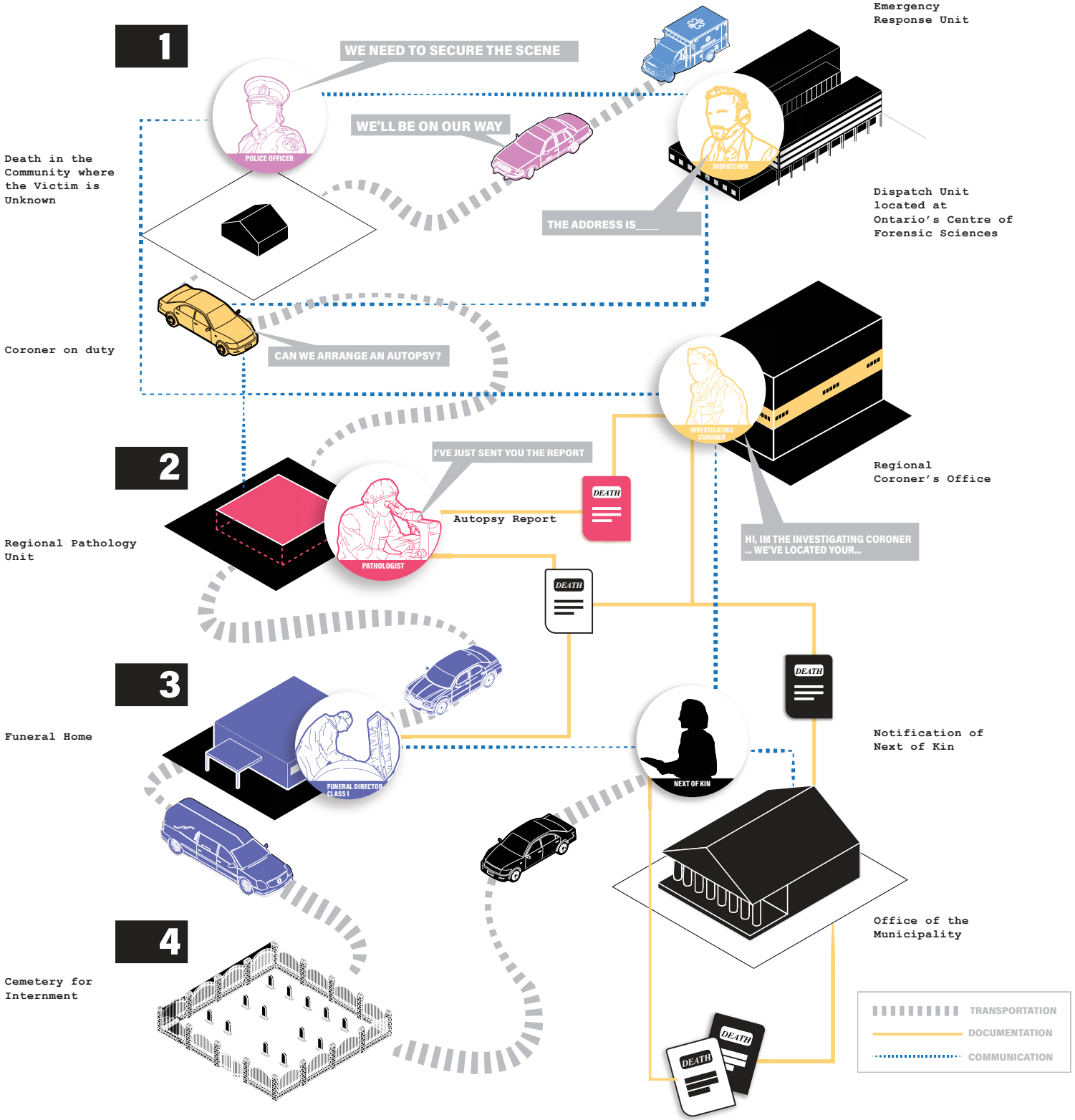


Fig 2-23 Diagram of body movement and system processess when death is reported in the community

Scenario 3: Death in the community
When a body is discovered, the police is often first notified, In this scenario, an officer who recieves the case notifies other parties of the emergency response unit as well as the dispatch unit. Details of the case are relayed to the coroners office where a regional supervising coroner assigns the case to a nearby coroner to attend. Upon documenting the site, the coroner may coordinate with the regional pathology unit to determine a suitable location for further examination if further investigation is required. The body is then transported to a suitable facility where upon autopsy, the pathologist completes an autopsy report which details the medical findings and circumstances regarding the death

Part 3

A TIMELINE IN CRISIS

ANALYZING VISIBILITY & HIERARCHY

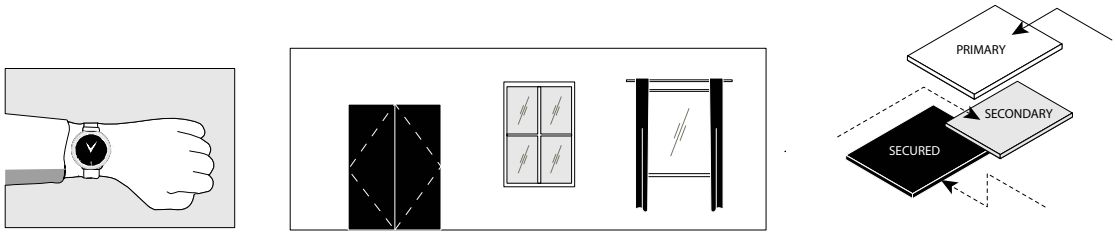


Fig 3-1 Illustration of deathcare visibility constraints

While COVID-19 devastated the physical, mental and financial heath of the world, it has positively affected communities in re-evaluating public health and allocation of resources for otherwise neglected communities. The virus has brought forth an unprecedented need to collaborate between countries and sectors, and with it, open data and research from otherwise private or non-medical researchers. Examples of this have flooded the news and range from maps charting the spread of the virus, to charts predicting the next wave, and infographics simplifying new guidelines. While the database regarding COVID-19 deaths are published daily for Ontario, the same cannot be said when locating resources for deathcare units themselves or statistics of patients or current practitioners. Operations within deathcare are likewise hard to chart as they have been designed to be unseen. This is done through time, obstruction from sight lines and through their unit layouts within facilities.

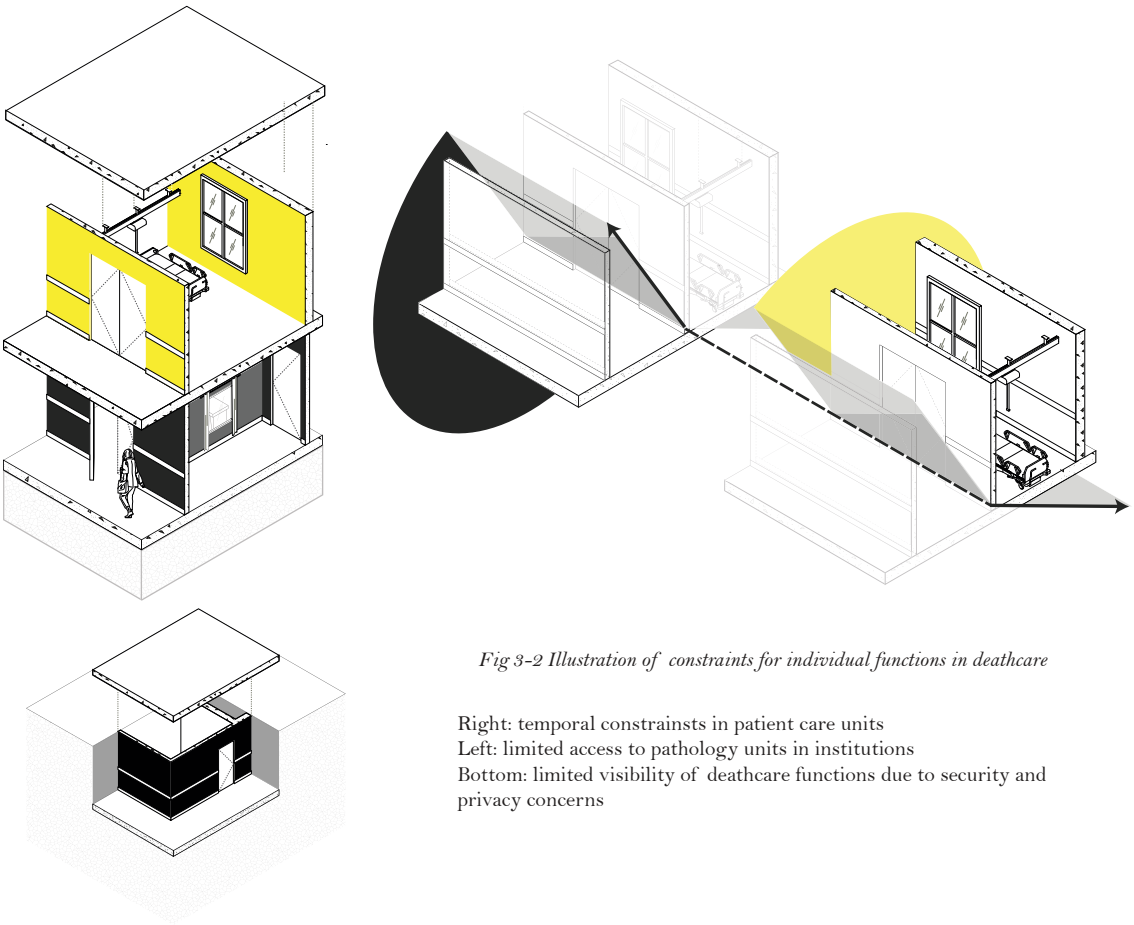


Fig 3-2 Illustration of constraints for individual functions in deathcare

Right: temporal constrainsts in patient care units
Left: limited access to pathology units in institutions
Bottom: limited visibility of deathcare functions due to security and privacy concerns

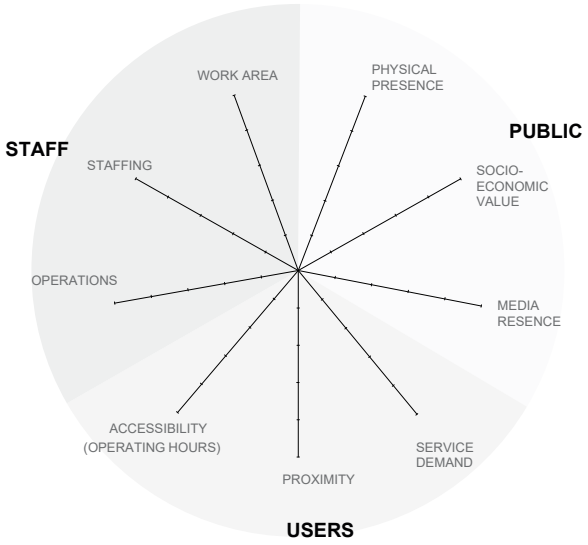


Fig 3-3 Visibility parameters in analyzing deathcare changes

Within Ontario's deathcare industry are three predominant service sectors: patient care services for elderly or terminally-ill patients, death investigations services to protect public health and to limit future similar deaths and bereavement services dedicated to helping communities and families commemorate those recently passed. Amongst the three, the death investigation sector and bereavement sector are the least visible as they not only operate within constrained time frames, like the patient care sector but are further removed from the public and other users in the building through the use of dedicated entrances or locating programs below ground. In researching death care in Ontario, data concerning funding of units, documentation of facilities, and details for death investigations were often found conflicting, dated or discussed abstractly at a high level. Understandably, these measures are in place to protect the identity of victims and families as well as the profits of corporations and institutions. Found data included generic practices and guidelines, interviews with prominent figures, slides from professional seminars or conferences, publishing are from the consensus, and a robust GIS databases for medical facilities, funeral establishments and government offices. [19]

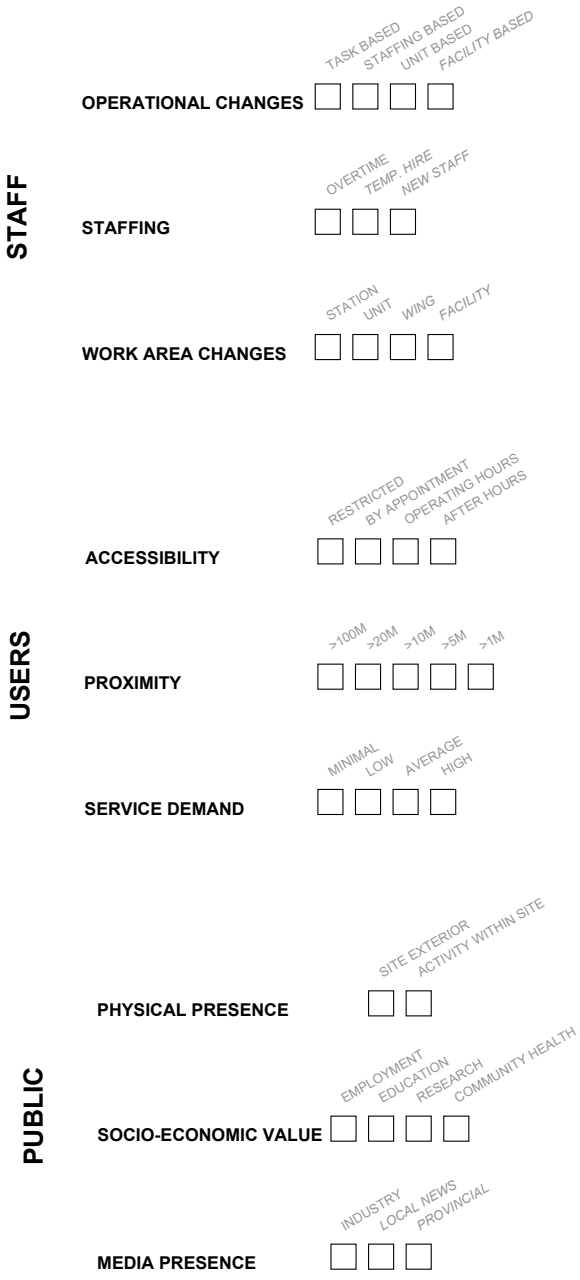


Fig 3-4 Proposed handles within the three parameters

19 *"Elder Abuse & Neglect."* Ontario Human Rights Commission, 2021.https://www.ohrc.on.ca/en/time-action-advancing-human-rights-older-ontari.

In comparison to the statistical data, the contextual details of units themselves are much more accessible and more importantly, coherent across sources. The visual and experiential qualities of, and within, these units are collected from construction guidelines, equipment manufacturer brochures, facility homepages and user interviews. The robust matrix takes form in a spider diagram, and visibility of these units are documented in the sequential events of crisis. As a visual tool, the matrix provides a basis to understand changes within each death care sector, but can be extrapolated to allow comparison within and between parameters (user groups). The staff visibility parameter can be used to analyze unit operations, with indicators outlining three areas of challenges:

1. Public Visibility: Operations, Existing Protocols and Guidelines
2. Staff Visibility: Staffing, Internal staffing
3. User visibility: Work Area, Unit design

In the following section, research will be presented in the sequence of deathcate crises indicated in Fig 3-5, starting with the initial state of Ontario's deathcare industry during the precedence crisis, followed by its continued strained operations entering into the programming crisis and its most critical state at present, the Acute Crisis No.1. At each stage, visible operational changes will be highlighted with its corresponding crisis color as well as charted using the spider visibility diagram shown in Fig 3-3.

Fig 3-5 Timeline of Deathcare Crises

LONG-TERM CARE

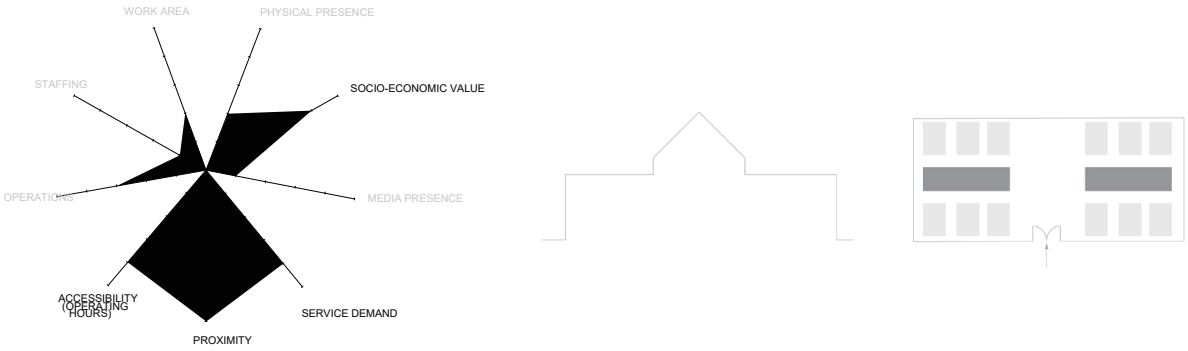


Fig 3-6 Visibility of long-term care homes during the precedence crisis

In the early years of the deathcare industry, professions within the death investigation and bereavement sector were largely unknown due to the nature of their work, and the emergence of new patient care typologies witnessed an unprecedented influx with the wave of baby boomers reaching retirement. For Ontario, this represented a period of new policies to regulate existing institutions and new challenges in its development of regional support for public safety. While challenges ranged from across three sectors, there was a common outcry within the deathcare community of disproportionate funding and support from their communities.

While education for patient care practices was built on already developed guidelines, there was minimal guidelines and accountability for long-term care homes. A history of neglect and abuse was eventually uncovered and cases of elderly abuse were reviewed in relation to pre-existing guidelines and represented a drastic change in the unit visibility for the public. [20]

MORGUE

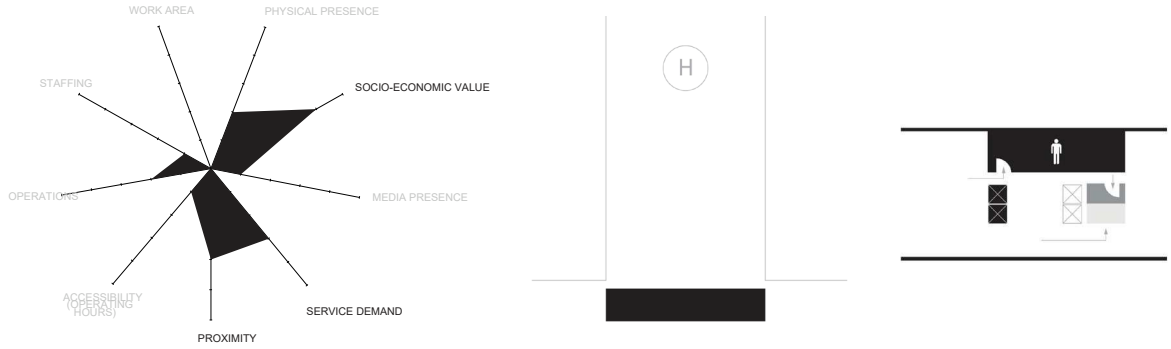


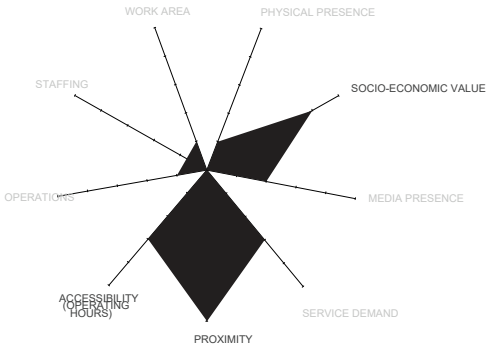
Fig 3-7 Visibility of morgues during the precedence crisis

> *"Following stepwise roll out in 2011 and 2012, investigating coroners are now contacted about a death through a central Provincial Dispatch. Prior to this, each region had different ways of contacting investigating coroners to notify them about a death. For example, some Regional Offices had their own call service to take calls about death investigationsvestigations."*
>
> *- Dr Dirk Huyer*[21]

20 *"Office of the Chief Coroner and the Ontario Forensic Pathology Service."* Ontario, September 21, 2022. https://www.ontario.ca/page/office-chief-coroner-and-ontario-forensic-pathology-service.

21 *"Office of Chief Coroner for Ontario, Report for the Years 2012-2015* at page 7 (LTC100072635), Exhibit 7, Overview Report: Office of the Chief Coroner and the Ontario Forensic Pathology Service ("OCC/OFPS OR"),

As the death investigation system developed, issues of logistics and planning were surfacing as regions operated independently. Contacting a coroner varied by region, where investigating coroners could be dispatched by a regional call center or a call service they enlisted. This resulted in undocumented deaths that were deemed non-reportable and reportable deaths that did not undergo an investigation would not be documented or peer reviewed.[22]



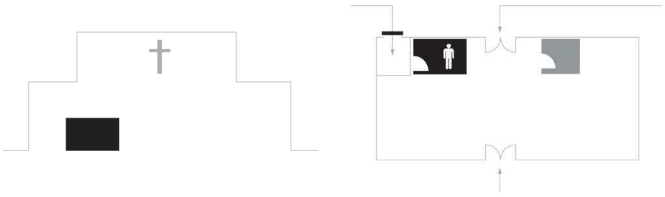


Fig 3-8 Visibility of funeral homes during the precedence crisis

As for the bereavement sector, a growing commercial industry, there emerged a need for regulating and institutionalizing existing practices for public safety. This lead to the regulation and accreditation of operators and the licensing of facilities by the Ontario Government.

LIMITED VISIBILITY - STATISTICS ON CIRCUMSTANCES OF DEATH

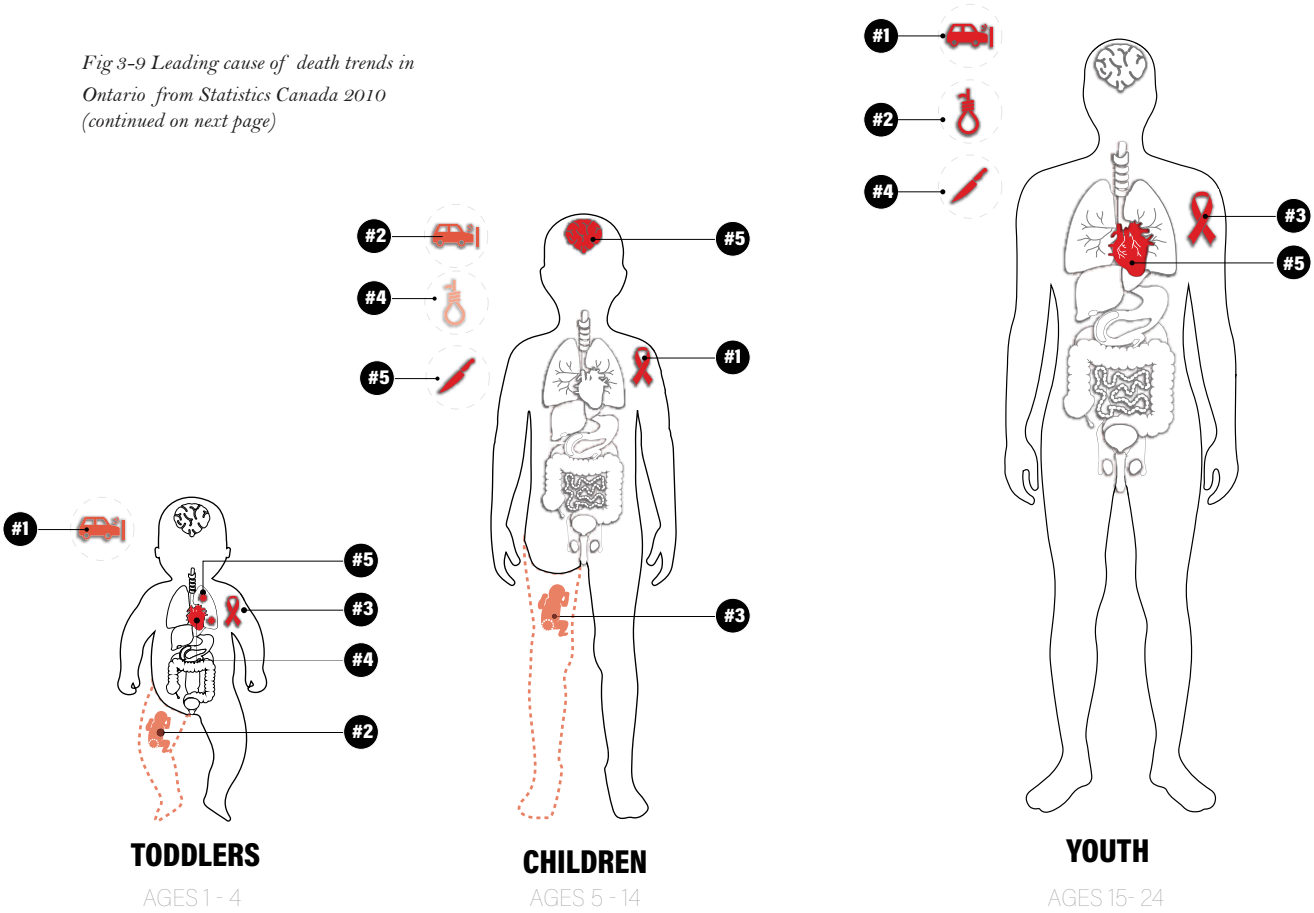
As a newly implemented database, the CCMED requires a thorough analysis of its data integrity and quality. This report provided the first opportunity to test the robustness of the database and to identify gaps in some of the variables—specifically, those describing the circumstances and activities surrounding the event leading to death. As the CCMED only covers the universe of "closed" coroner and medical examiner cases and covers deaths that occurred during the period 2006 to 2008. 23 When the year of death is unknown, the year in which the death was discovered is used.

Individual coroner or medical examiner offices collect different levels of detail for particular deaths according to the importance of certain types of deaths in their jurisdiction. The minimum dataset of the CCMED may have only one level of detail for the same types of death, such that there are instances where this will result in a loss of detail in the information that was collected at the coroner or medical examiner office versus what was mapped and sent to the CCMED.

22 *"Office of the Chief Coroner and the Ontario Forensic Pathology Service."* Ontario, September 21, 2022. https://www.ontario.ca/page/office-chief-coroner-and-ontario-forensic-pathology-service.

23 *"Canadian Coroner and Medical Examiner Database, Annual Report."* Government of Canada, April 3, 2013. https://publications.gc.ca/site/eng/411921/publication.html.

Fig 3-9 Leading cause of death trends in Ontario from Statistics Canada 2010
(continued on next page)



From the CCMED 2006 to 2008 database, coroners and medical examiners across the nation conducted 59,709 deaths that were deemed natural. [24]While the classification for natural deaths is disease initiated, figures indicate that the overwhelming majority of these cases occur at a private residence (45%) or at medical facilities (48.1%).[25] While these locations are consistently ranked highest among all provinces, their distribution percentage can vary drastically. For example, deaths that occurred at a private residence make up 22.6% of the natural death cases in New Brunswick but are a much higher ratio, 68.7%, in Saskatchewan. Issues at medical services facilities are even more drastic, making up 23.5% of Yukon's natural death cases compared to 87.2% of New Brunswick cases. [26]

The varying data demonstrates that while natural deaths occurring at a hospital, health professional office, nursing home or long-term care homes make up the predominant death investigation cases in Canada, their varied distribution across provinces allude to differing reporting parameters observed by each system.

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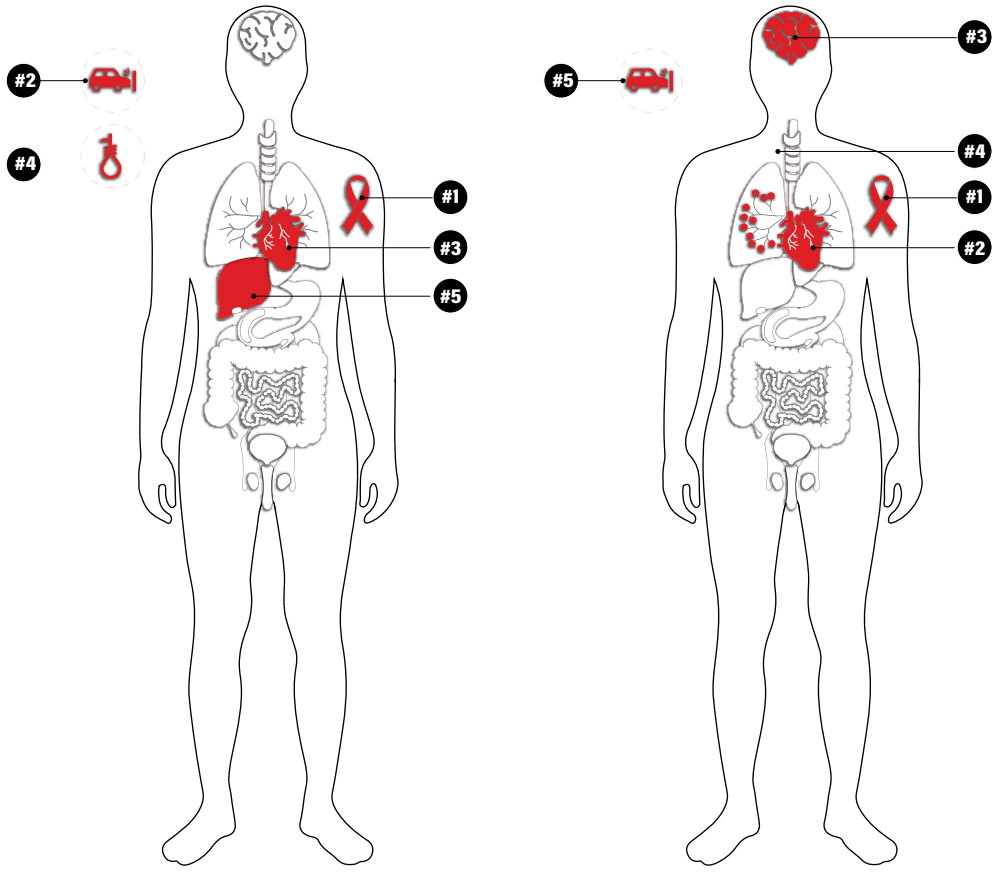
24 *"Number of Deaths Investigated by a CCMED, by Year, Provinces and Territories, 2006 to 2008."* Statistics Canada, November 27, 2015. https://www150.statcan.gc.ca/n1/pub/82-214-x/2012001/gen-eng.htm.

25 *"Canadian Coroner and Medical Examiner Database: Annual Report."* Statistics Canada, 2006. https://publications.gc.ca/collections/collection_2012/statcan/82-214-x/82-214-x2012001-eng.pdf.

26 *"Number of Deaths in Canada in 2022, by Province."* Statista, October 25, 2022. https://www.statista.com/statistics/444895/number-of-deaths-in-canada-by-province/.



PIECEMEAL LEGISLATIVE STRUCTURE

Ontario operates on a coroner's system, meaning the Office of the Chief Coroner reviews all reported deaths. The main advantage of a coroner system is in its ability to represent community needs, where the values of the representatives resonate with the majority. While neither of the two predominant death investigation systems is without flaws, researchers have argued that the disadvantages of the coroner system heavily outweigh their advantages. In Ontario, the Chief Coroner has been elected like other local officials and shares opportunities in competing for office funding and withstanding political pressures. In addition to their autonomy, Ontario's English common law history also gives them the legal power to execute subpoenas or inquests. However, the autonomy and power of a coroner system have also made visible its more severe disadvantages: where those appointed may not be knowledgeable in forensics or medical examinations, and once appointed, are unlikely to be revoked of their privilege. Staff visibility undergoes the most significant change in the

PROGRAMMING CRISIS

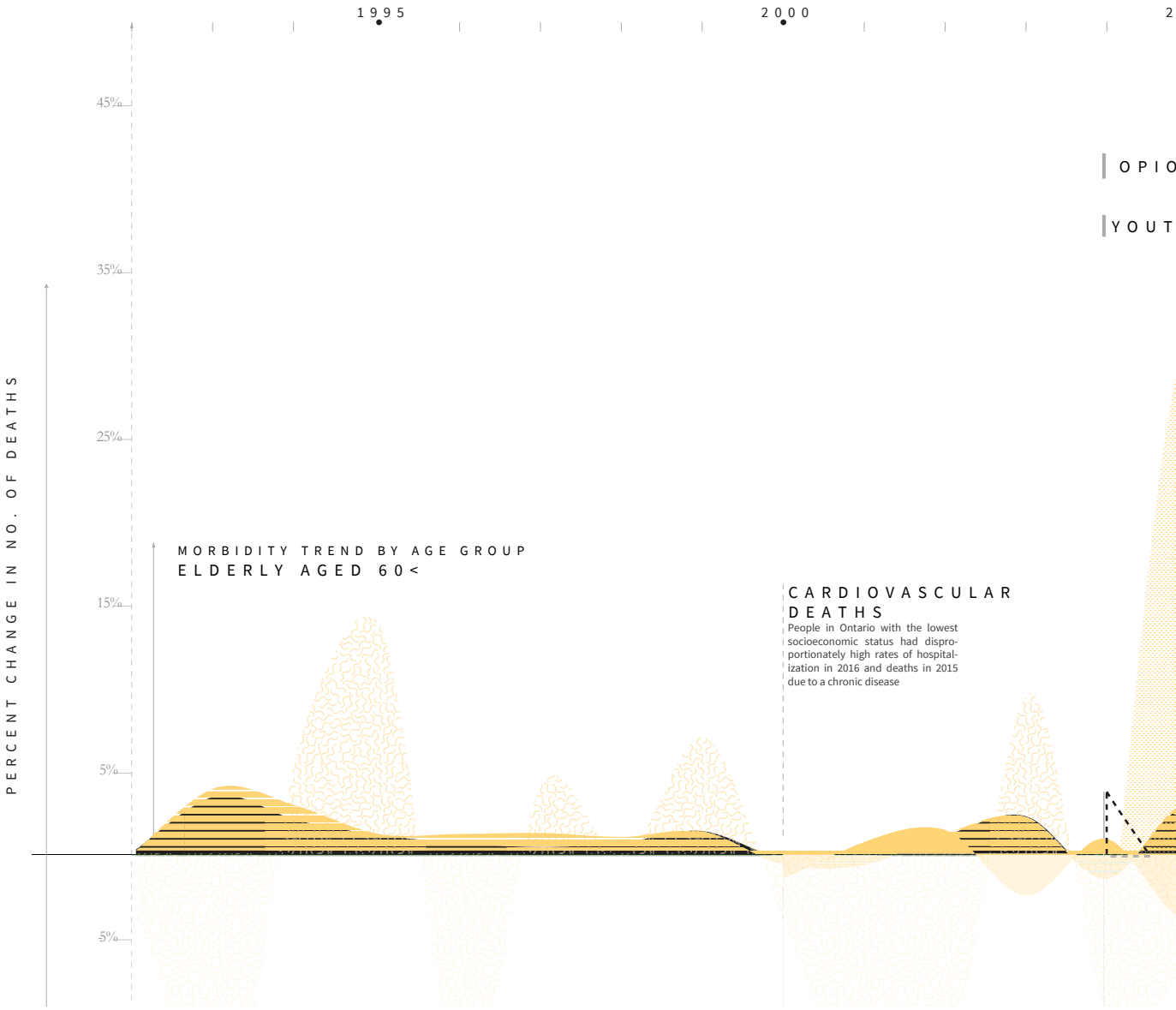
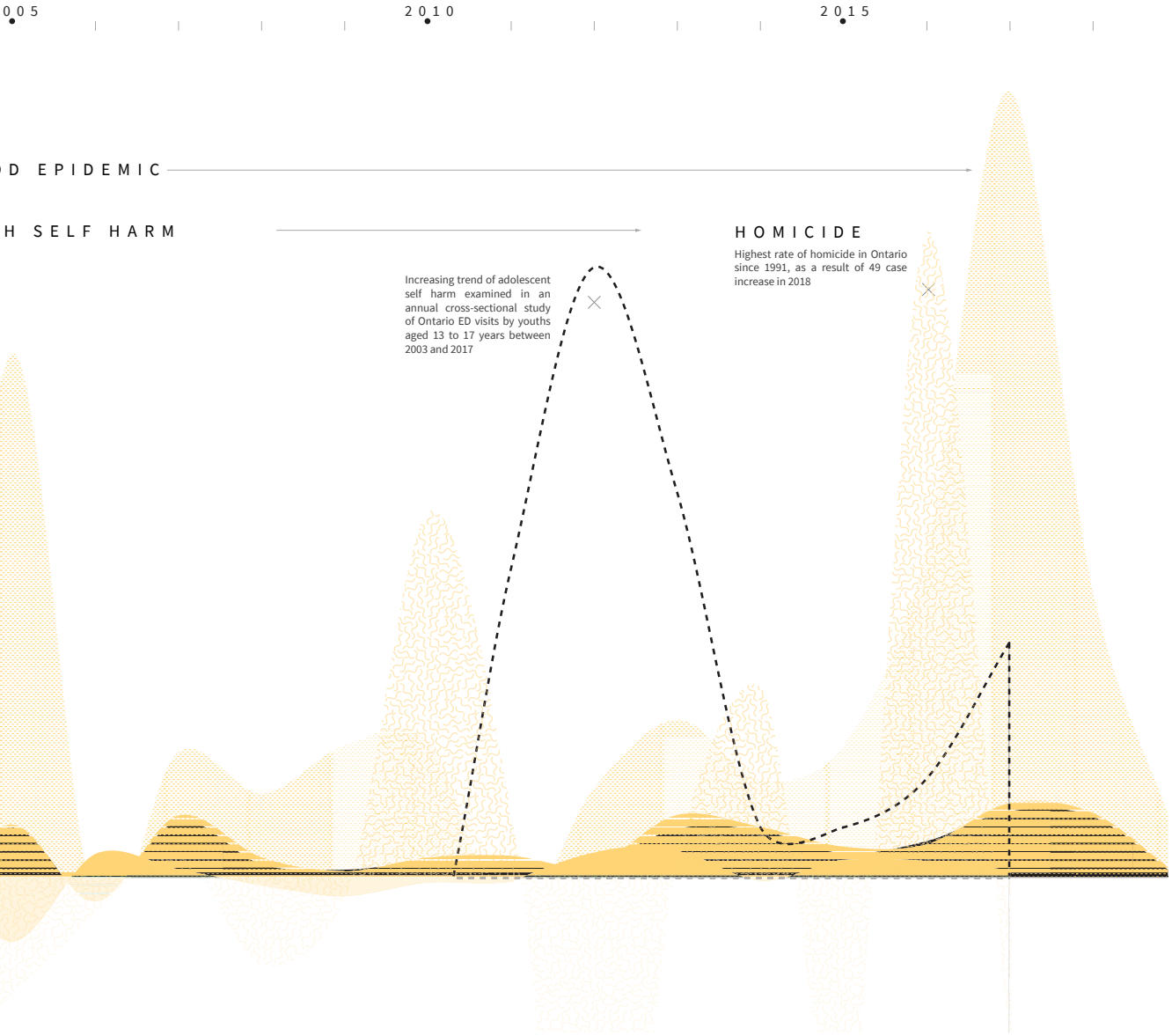


Fig 3-10 Emerging trend of opiod deaths emerges during the programming crisis

As deathcare sectors transitioned from the Precedence crisis to the Programming crisis, operational challenges such as staffing shortage and limited funding have yet to be resolved These include staffing needs within units due to a retiring era of practitioners and an existing demand for roles. Coupled with the emerging trend of opioid overdose (see Fig 3-10), the increasing caseloads placed further strain on an already precarious system. (See Fig 3-101, Fig 3-12) While concerted efforts have been made in the education and training in the death investigation sector, compensation in Ontario and other parts of Canada has been a deterrent for applicants.

Fig 3-11Illustration of new opiod use in Hamilton region



Prominent Issues Emerging from the Programming Crisis :

1. Issue with spatial Limitations: Unit Growth
2. Issues with Unit Staffing: Shortage of and delays by Professionals
3. Issues within Operations: Oversight on cases and Compounding Caseloads

Fig 3-12 Illustration of Ontario Provincial Police fentanyl drug bust

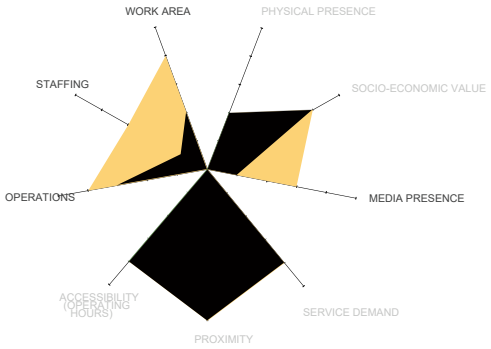


Fig 3-13 Changes in long-term care visibility during the programming crisis

PATIENT CARE

In 2011, the first wave of baby boomers turned 65, triggering a new era for the country's patient care providers as the senior population witnessed steady growth over the next two decades.[27] The change in Canada's population of seniors, the prevalence of chronic conditions, and increased expectations of independence and living at home will place significant and potentially different pressures on the already strained patient care system and will be further discussed in part four, *Ad-Hoc Solutions and The Next Acute Crisis.*

DEATH INVESTIGATION SECTOR

While the precedence crisis highlighted a need for staffing and support for the existing death investigation system, these constraints were not met and further challenges arose during the programming crisis. Units that were already at or near capacity would soon reach their limit and this resulted in facilities overflowing, stockpiling of bodies within other areas of the facility and the need to locate temporary cold storage. While the illustrations on the right (see Fig 3-50) may just be a temporary concern, some may recall reports from 2019 announcing Hamilton's FPU closure the following year.

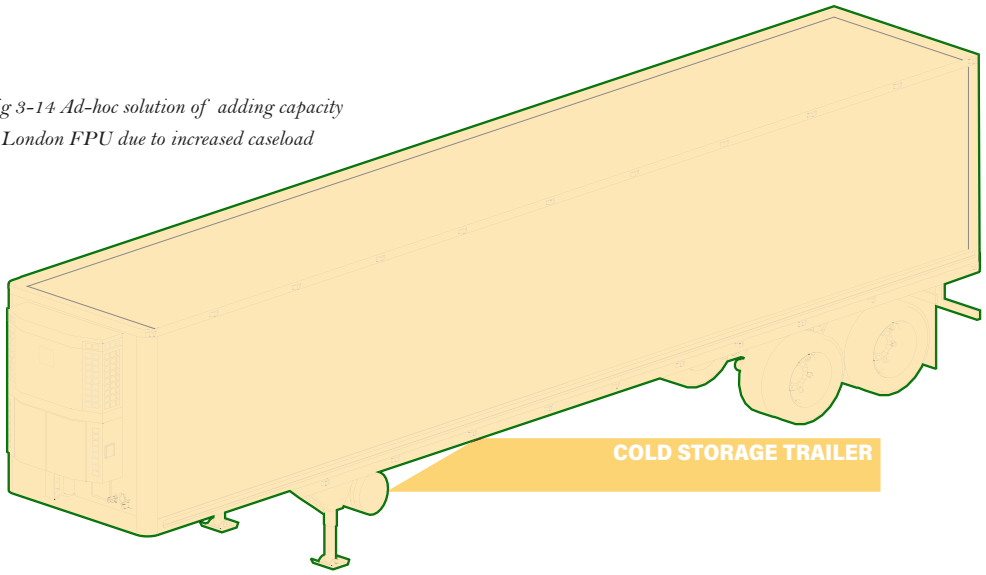


Fig 3-14 Ad-hoc solution of adding capacity at London FPU due to increased caseload

Cold storage reefers captured in the loading bays of Ontario hospitals amaidst the surge of deathcase in Hamilton

27 Cohn, D'Vera, and Paul Taylor. *"Baby Boomers Approach 65."* Pew Research Center, December 20, 2010. https://www.pewresearch.org/social-trends/2010/12/20/baby-boomers-approach-65-glumly/.

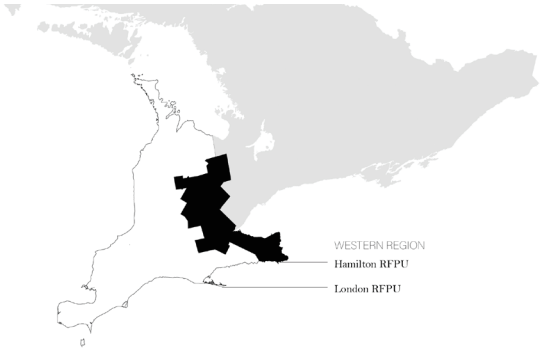


Fig 3-15 Map of Western Forensic Pathology Region previosuly supported by London and Hamilton forensic pathology units

Fig 3-16 Jurisdictions originally serviced by Hamilton FPU

In 2019, the announcement was made for the unit's closure the following year, and was followed by disbelief and concerns from its community. Among the original seven units in Ontario, the targeted unit was regarded as the second busiest. And while provincial heads tried desperately to reassure the public and reasoned about staffing shortage, the closure announcement came only a week after a controversial court hearing. Without dwelling on the details of the case, the province's Chief Forensic Pathologist and Chief Coroner were accused of misconduct. The allegations were raised by Hamilton's previous medical director but were supported by local staff who testified. Without evidential justifications for the closure, the announcement

Fig 3-17 Map of Western Forensic Pathology Region with breakdown of Hamilton FPU caseloads

Fig 3-18 Relocation ofHmailton Caseloads to Toronto Provincial FPU leading to Overcrowding at London

marked the "erosion of the integrity of death investigation in Ontario". [28] Formed as a bipartisan agency, The Death Investigation Oversight Council, is seen as an independent body that oversees coroners and pathologists. However, amongst its members are the acting and supervising chief coroner and forensic pathologist. With increasing allegations of conflict of interest, an investigation was conducted by the Auditor General and published in the 2019 Annual Report [29]

"Overall, our audit found that the Office does not have effective processes to demonstrate that its coroners and pathologists consistently conduct high-quality death investigations, and does not sufficiently analyze data or follow up on the implementation of its recommendations to improve public safety and to help prevent further deaths." *- Auditor General*

While death investigations are conducted by the public sector with support from healthcare institutions, standards for operations are monitored by the auditor general. Upon the foreclosure of the Hamilton Pathology Unit, the office conducted a detailed review of the Office of The Chief Coroner and Ontario Forensic Services in 2018 and high level remarks illustrated operational concerns. [30] This included the continued employment of coroners that had been sanctioned for unprofessional behavior

28 Blatchford, Christie. *"National Post." Christie Blatchford: Was Hamilton forensic pathology unit punished for testifying against provincial bosses?* July 19, 2019. https://nationalpost.com/opinion/christie-blatchford-was-Hamilton-forensic-pathology-unit-punished-for-testifying-against-provincial-bosses (accessed April 10, 2021).

29 Lysyk, Bonnie. *Lack of Management Oversight Compromises Death Investigations.* 2019 Annual Report, Toronto: Office of the Auditor General of Ontario, 2019.

30 Ibid.,193

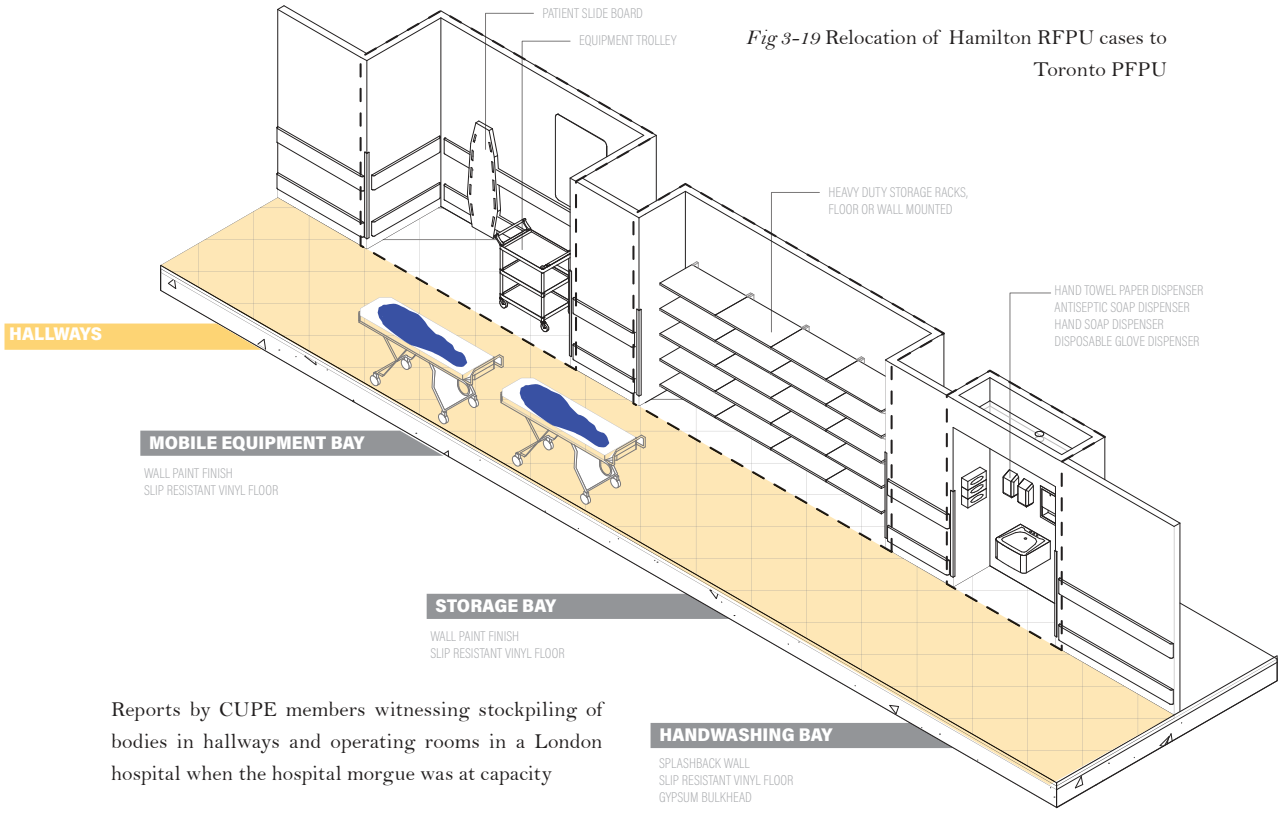


Fig 3-19 Relocation of Hamilton RFPU cases to Toronto PFPU

Reports by CUPE members witnessing stockpiling of bodies in hallways and operating rooms in a London hospital when the hospital morgue was at capacity

by the College of Physicians and Surgeons, the lack of communication between coroners and the public after an inquest involving concerns of safety, failure in utilizing collected death data by the office to analyze trends and to develop recommendations for Ontarians, limited responsibility by the office when refusing a case request and not following up with the family, unsatisfactory due diligence in analyzing coroner caseloads, and lack of governance in-place for performance check-ins and to identify instances of questionable billing practices.

As a result of the closure, existing and future caseloads would be directed to the provincial pathology unit in Toronto. But despite support from Toronto's provincial centre, the smaller but much closer London unit was on a much more accessible route for western region facilities. and was soon overwhelmed. CUPE members have since reported on the unlikely spaces (see Fig. 3-14) they've witnessed bodies being stored and representatives have been quick to locate more suitable space beyond their facilities.[31]

"The closure of this unit will lead to costly delays in police investigations and trials. How can the Conservatives just close their ears to the chorus of respected voices calling for a reconsideration of the decision to shut down the second busiest pathology unit in Ontario?" *- CUPE*

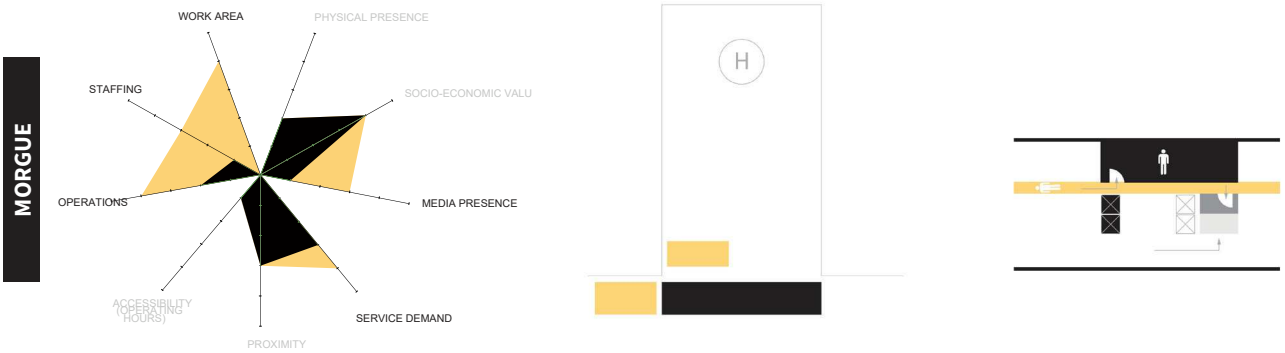


Fig 3-20 Changes in morgue visibility during the programming crisis

31 CUPE. *With many troubling allegations tied to closure of Hamilton/Niagara forensic pathology, CUPE calls on Conservatives to launch independent review. Ottawa*, September 19, 2019.

BEREAVEMENT SERVICES SECTOR

For the bereavement sector, changes are the most drastic due to professional regulations and reports of overflowing morgues. While this sector has witnessed fluctuating caseloads, the unprecedented influx coupled with the local climate made burials unfeasible and exhausted alternate cold storage solutions. As a result, operations needed to pivot to accommodate new caseloads, and units worked around the clock to facilitate

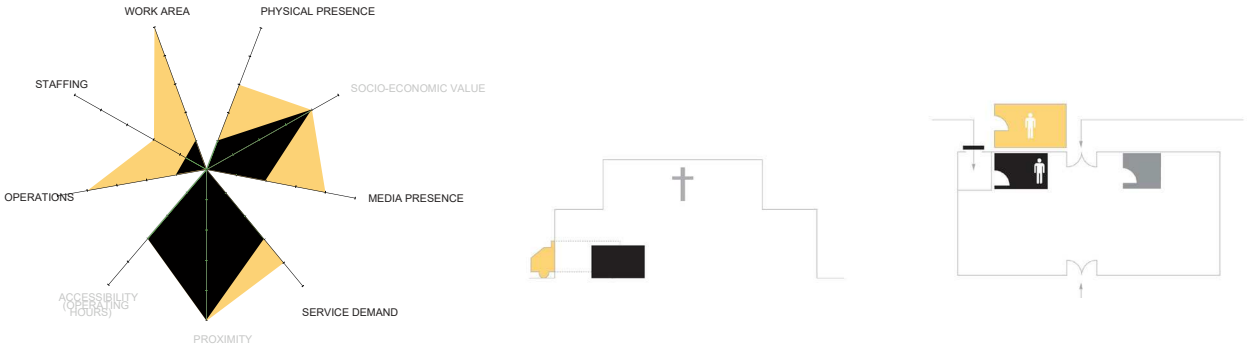


Fig 3-22 Changes in funeral home visibility during the programming crisis

dispositions.

In response to user concerns about price gauging in the Precedence Crisis, the Bereavement Authority of Ontario was formed to regulate existing operators. While the BAO is not a government entity and has an independent Board of Directors, it is a not-for-profit corporation that provides oversight and is responsible for the licensing and enforcement of funeral operators, cemetery closures and burial site operations within the province. On the consumer level, it provides a single point of contact for the bereavement sector and protects the public by regulating and ensuring compliance among operators. While there remains an open database for Toronto bereavement operators, the most extensive collection is accessible through the Public Register. It contains facility names, Licensure numbers, (operational) classification and (licensure) status, and their geographical locations.

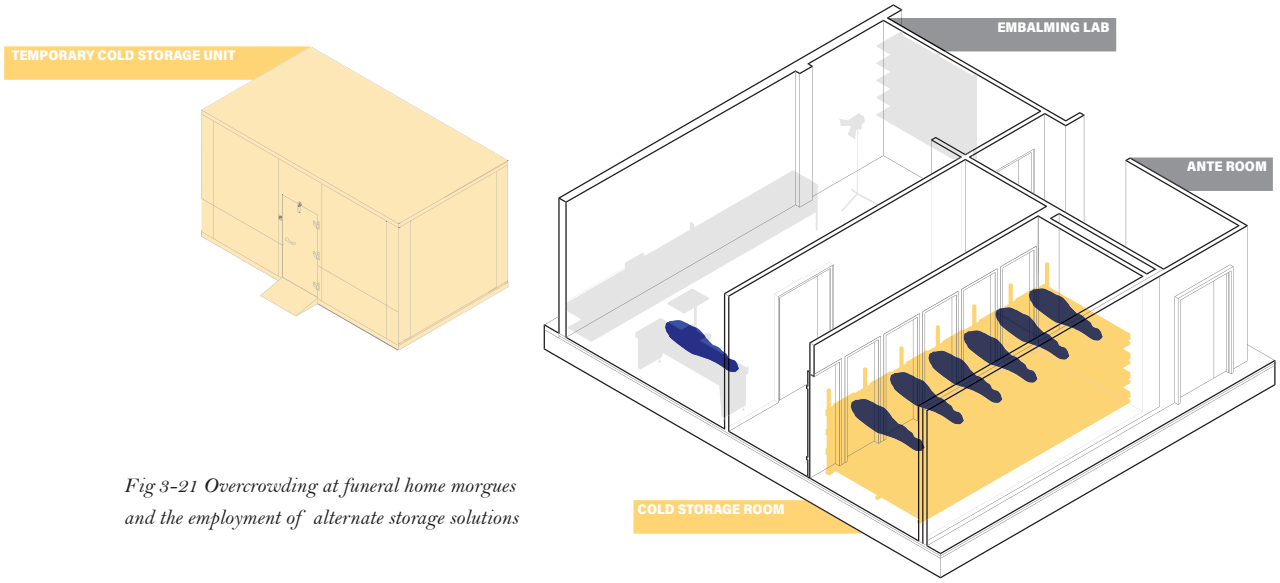


Fig 3-21 Overcrowding at funeral home morgues and the employment of alternate storage solutions

PERFORMANCE CONCERNS

From data published by the Ontario Forensic Pathology Service (OFPS), timeliness for autopsies was used as a critical indicator to document progress. To give context, pathology cases in Ontario are reviewed by Forensic Pathology Units (FPUs) and community hospitals. These units are located in regional hospitals across the province where pathologists based in community hospitals take on less complex issues. While turnaround times may be influenced by case complexity, return of other findings, pathologist workloads and unit staffing, the current standard is to have autopsy reports completed within 90 days of the postmortem examination.

From the 2020 Forensic Pathology Service Annual Report, statistics from 2010 to 2020 show average turnaround times were met in most years by pathologists in community hospitals. However, forensic pathology units (FPUs) have not yet completed it. As more complex cases are assigned to FPUs, this likely contributes to the longer turnaround time. However, due to limited staffing, the return of other findings such as those required for proof of evidence, are primarily taken on by fee-for-service laboratories or other laboratories. This is prevalent in anthropology and histology, wherein the reporting period April 1, 2019, to March 31, 2020, 439 anthropology cases were made during the employment of one full-time anthropologist, and 4000 tissue specimens were processed each month with two full-time histotechnologists employed. In addition to limited unit staffing, autopsy reports rely on lab analysis for postmortem samples, such as those for toxicology. During the reporting period, the average time needed for toxicology was 38.8 days, a substantial testing time in the 90 days for autopsy reports. [32]

OCCUPATIONAL STRATIFICATION

While deathcare work may be physically demanding, such as the daily tasks of transfer staff or attendants, the retainment of existing staff has been challenging due to stigma of deathcare work and the internal and external traumas of witnessing death daily. From the global studies completed by select governments and private agencies, research interviews with attending staff on their working conditions have produced the following themes:[33]

- Secondary trauma for families
- Delays by health professionals
- Dehumanized mortuary staff

The above point to a primarily neglected occupation where temporal constraints and internal trauma are imposed on its workers. While the shortage of pathologists in Ontario has been supplemented over the years due to advocacy in the profession, the profession is still deeply underfunded regarding resources in the working environment. With hospitals trying to retain workers past retirement, many units are short-staffed, overworked, and under scrutiny to perform beyond their responsibilities.

> *“ Hospitals should have at least two pathologists to ensure the results of each diagnosis are double-checked....Why do they put two pilots on an airplane? Why do they put two engines on an airplane? In case one breaks down, they have a back up, ”*
>
> *- New Brunswick Pathologist* [34]

32 Ibid.,193

33 Brysiewicz, P. *“The lived experience of working in a mortuary.” Accident and Emergency Nursing*, no. 15 (2007): 88-93.

34 CBC. *“Pathologist shortage a national problem: officials.”* CBC. February 15, 2008. https://www.cbc.ca/news/canada/new-brunswick/pathologist-shortage-a-national-problem-officials-1.705121 (accessed April 15, 2021)

ACUTE CRISIS NO.1

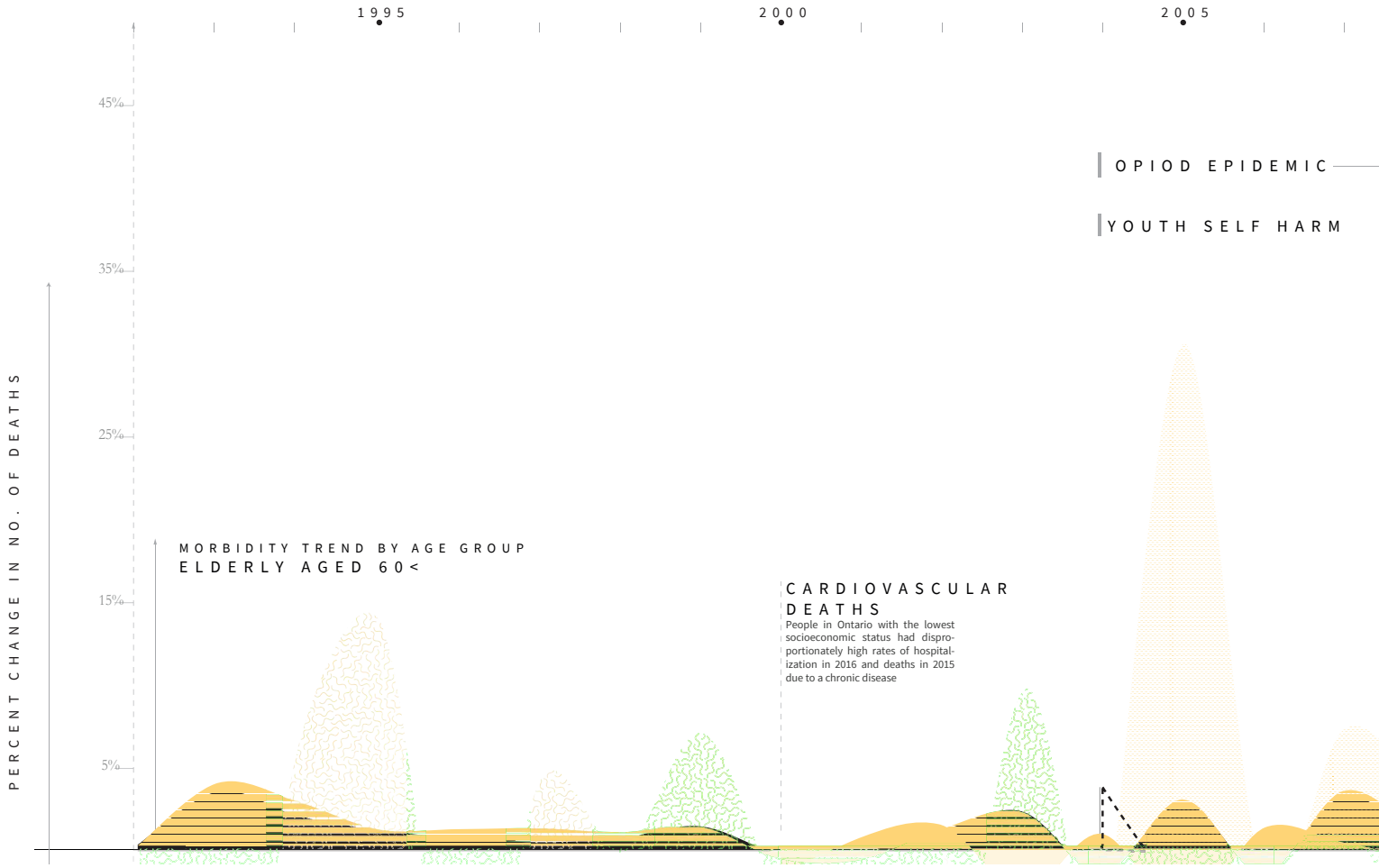
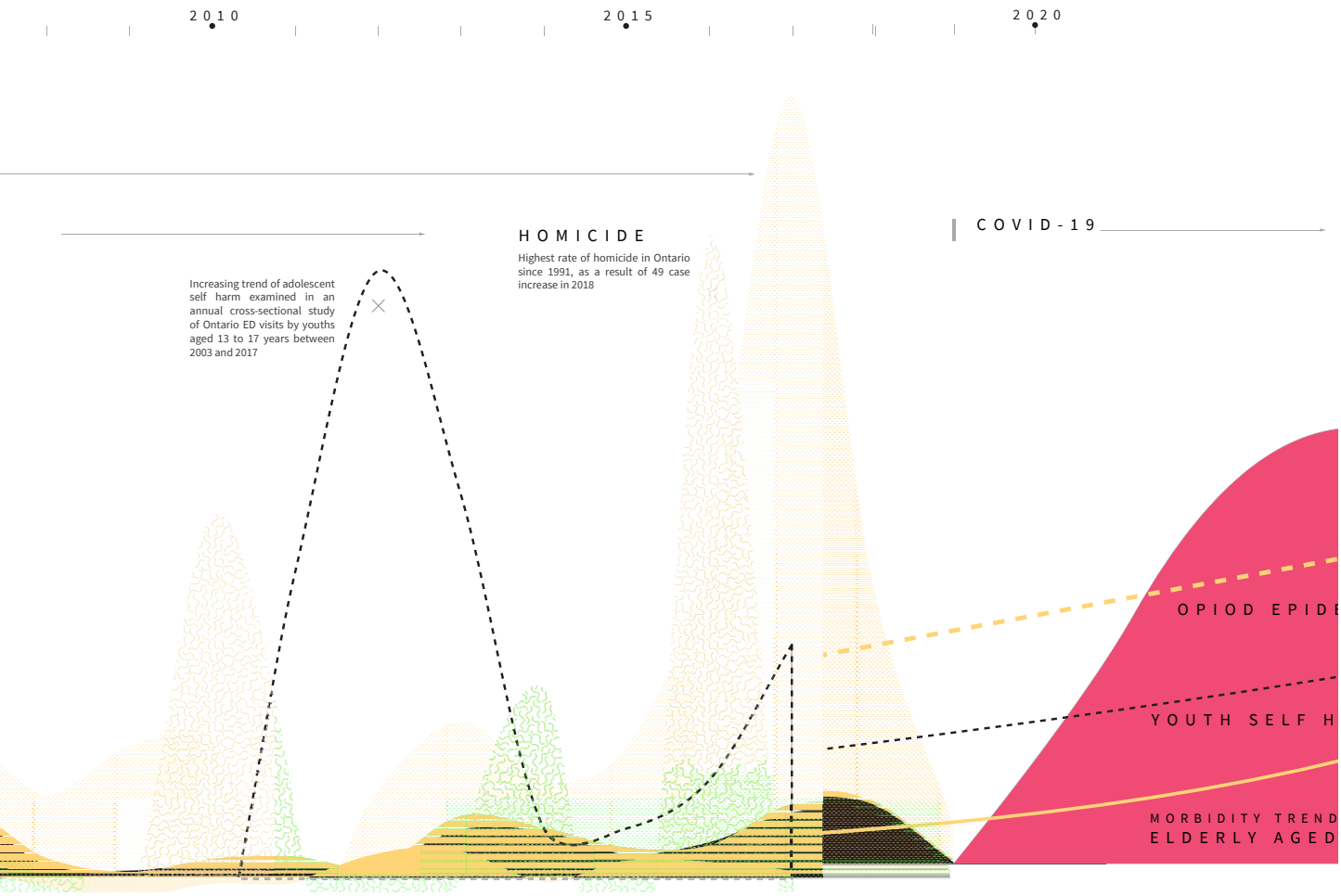


Fig 3-23 Erection of Field Morgues / Use of cold storage trailers visible at the pedestrian level

The year 2020 was unprecedented on varying accounts but will undoubtedly be remembered by a global pandemic bringing the world to a shuttering halt. Despite a global effort to limit the spread of the virus, local healthcare systems worldwide remain strained as reports of new strains continue to populate our news. As of December 2021, the global cumulative death count sits at 5,285,888. [35] The North American region has reported 2,369,006 deaths as the leading global region and accounts for nearly 50% of all cases. [36] As nations scrambled to flatten the outbreak's curve, the virus tested the capacity of healthcare systems and local morgues, and with the overwhelming number of fatalities came one of the most shocking images of the pandemic's consequences: the erection of temporary morgues and mass graves. Using the context of the current pandemic, we examine the effects of a virus that is as lethal as it is non-discriminate. And in its wake, the various emergency responses each nation has taken and the inherent propensity of partisanship in governments.

35 . Ireland, Nicole. *"Funeral, Crematorium Workers Hope They're Not Forgotten in COVID-19 Vaccine Rollout."* CBC, February 23, 2021. https://www.cbc.ca/news/canada/toronto/funeral-crematorium-workers-covid-19-vaccination-1.592

36 *Who Moved My Data? Breaking Down Information Silos in Death Care."* OpusXenta, August 4, 2020. https://opusxenta.com/who-moved-my-data-breaking-down-information-silos-in-death-care/.



Prominent Issues Emerging from the Programming Crisis :

1. Crisis within facilities: Overflow at Morgues
2. Crisis within Units: Clinicians faced with overwhelming caseloads
3. Crisis within the Industry: Inadequate Resources

While Ontario's capital has not had to resort to such measures to date, the likelihood of a future Mass Fatality Incident (MFI) overwhelming Toronto's mortuaries is a reality. Compared to smaller neighboring regions, such as Ottawa and London, the erection of temporary facilities for deathcare will be a more significant threat due to the city's spatial limitations as a metropolis, its near-capacity and over-worked mortuary system, and the unpredictable extents of physical and mental health impacts increasing morbidity and mortality.

Today, current guidelines reference publications by authoritative international bodies on the treatment and handling of dead bodies in MFI's, however, the Canadian government has yet to provide a tailored approach that addresses local climate, space planning restrictions, and available national resources. the spatial limitations effecting the health care sector were further amplified in the death care sector. While institutions continue to prioritize the expansion and funding for patient units, their less public-facing and income-generating counterparts are often located below ground and allocated the minimum square footage of space.

> *"We're always looking at the people who are taking care of the living. But there's also all kinds of people behind the scenes taking care of the dead,"*
>
> *- Barbara-Anne Patterson, a crematorium operator in Milton* [37]

While the erection of temporary morgues and mass graves results from an overlooked and severely taxed mortuary system worldwide, mass graves are not a viable solution for Canada due to its geographical climate and urban density that limit burial plot requirements. Therefore, the disposal of dead bodies is limited to temporary morgues, which are facilitated by the use of cold storage trucks, trailers, or arenas. [38] While refrigerated conditions provide clinicians additional time to work through management procedures and retrieval by next of kin, normal operations are further complicated in a pandemic. With the majority of local morgues in the United States already working near capacity or with inadequate resources prior to the epidemic[39] these issues are compounded and echoed in interviews with forensic pathologists working on the front lines of COVID-19 .Despite federal and municipal laws in North America emphasize the need for swift action under the guidelines of international humanitarian law, these requests are often exhausted in the management of dead bodies and can lead to infections across the community. With clinicians' and mortuaries' work falling within a larger chain of events,ere is a need to address conflicting but well-meaning recommendations and identify critical timelines in logistic operations and appropriate resources relative to the local region.

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37 Ireland, Nicole. *"Funeral, Crematorium Workers Hope They're Not Forgotten in COVID-19 Vaccine Rollout."* CBC, February 23, 2021. https://www.cbc.ca/news/canada/toronto/funeral-crematorium-workers-covid-19-vaccination-1.5924042.

38 McKenzie-Sutter, Holly. *"Ontario Hospitals Use Temporary Morgues as Coronavirus Deaths Rise."* Global News, January 6, 2021. https://globalnews.ca/news/7558966/some-ontario-hospitals-use-temporary-morgues-coronavirus-deaths/.

39 Loose, Cindy. *"Funeral Homes, Morgues Grapple with Surge in US Covid-19 Deaths."* CNN Health, December 15, 2020. https://www.cnn.com/2020/12/15/health/funeral-homes-morgues-covid-deaths-wellness-partner/index.html.

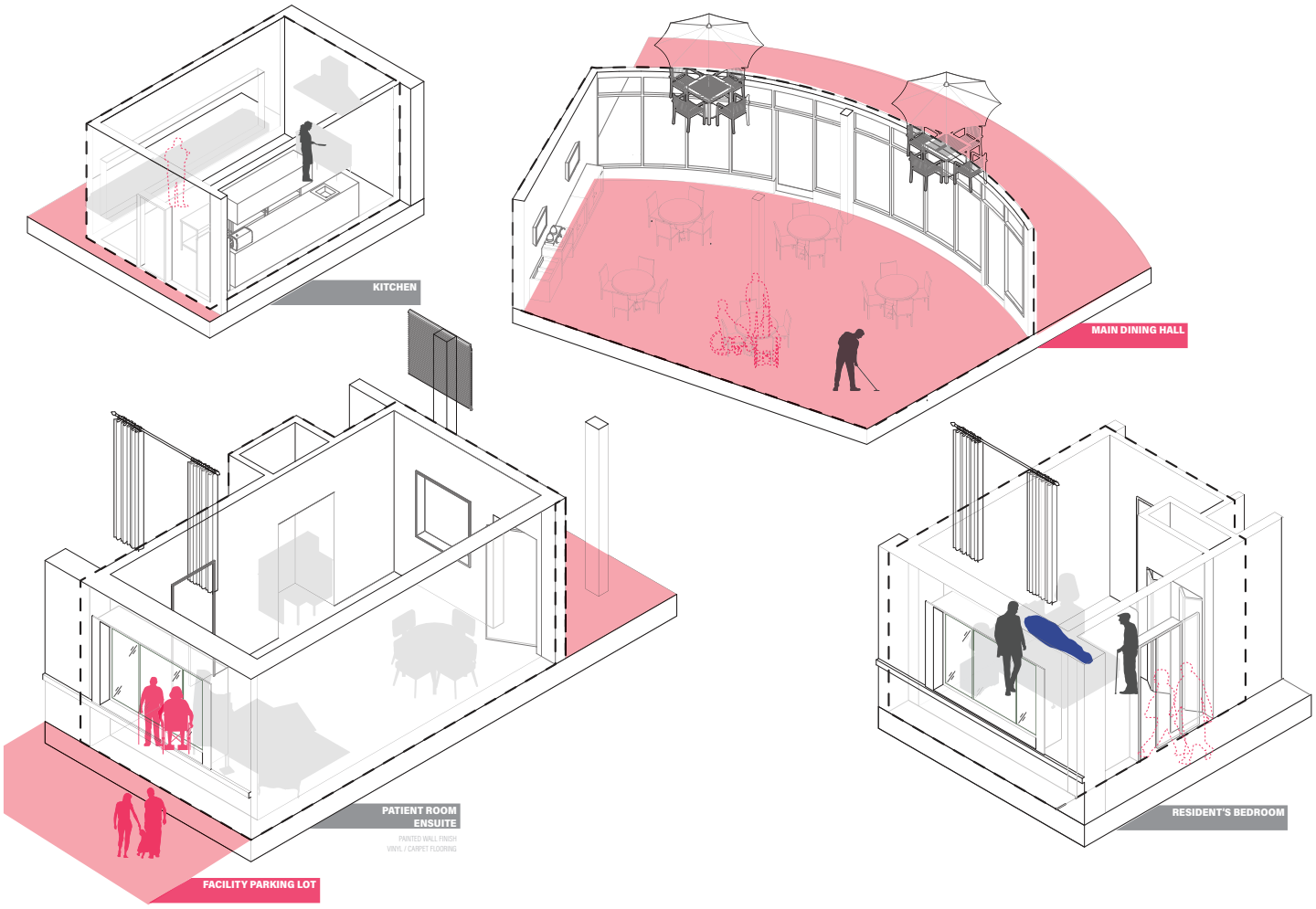


Fig 3-25 Changes documented in long-term care homes during Acute Crisis No.1

Top left and right: communal spaces are no longer accessible or in use, dining halls are now used as intermediary spaces for food drop off for residents
Bottom left: as many facilities have now restricted visitation access, families are limited to gathering outside residents' windows
Bottom right: provincial protocols have begun restricting funeral home transfer staff access into facilities, the task of transfering bodies is therefore placed on LTC home attendants

OVERFLOW AT MORGUES

Amongst the pandemic uncertainties are the urban population density in major cities and families' migration to more rural outskirts for larger homes. While this trend may end with returning to offices, prominent tech giants such as Twitter and Facebook have announced the permanent migration to remote working2. With the new work from home norm coupled with making mental health and wellness a priority3, urban densities are likely to decline, and regions spread wider. Restructuring political and regulatory controls at borders can help foster new financial mechanisms for stakeholders and users in fragmented communities and generate a more hybridized system.[40] Interim body handling restriction and guidelines from governing bodies have been well-meaning but noted as contradictory by users. The stress placed on clinicians is directly linked to the need to act swiftly but quickly compounded when layered with legal liabilities. While resources are usually in place to facilitate consoling family members and an independent process for body transportation out of morgues, the pandemic has created an influx in coffin demand with limited economic options and ultimately targets marginalized communities. Existing bureaucratic infrastructures must address their divided processes and decouple clinicians' legal obligations in medicine. [41]

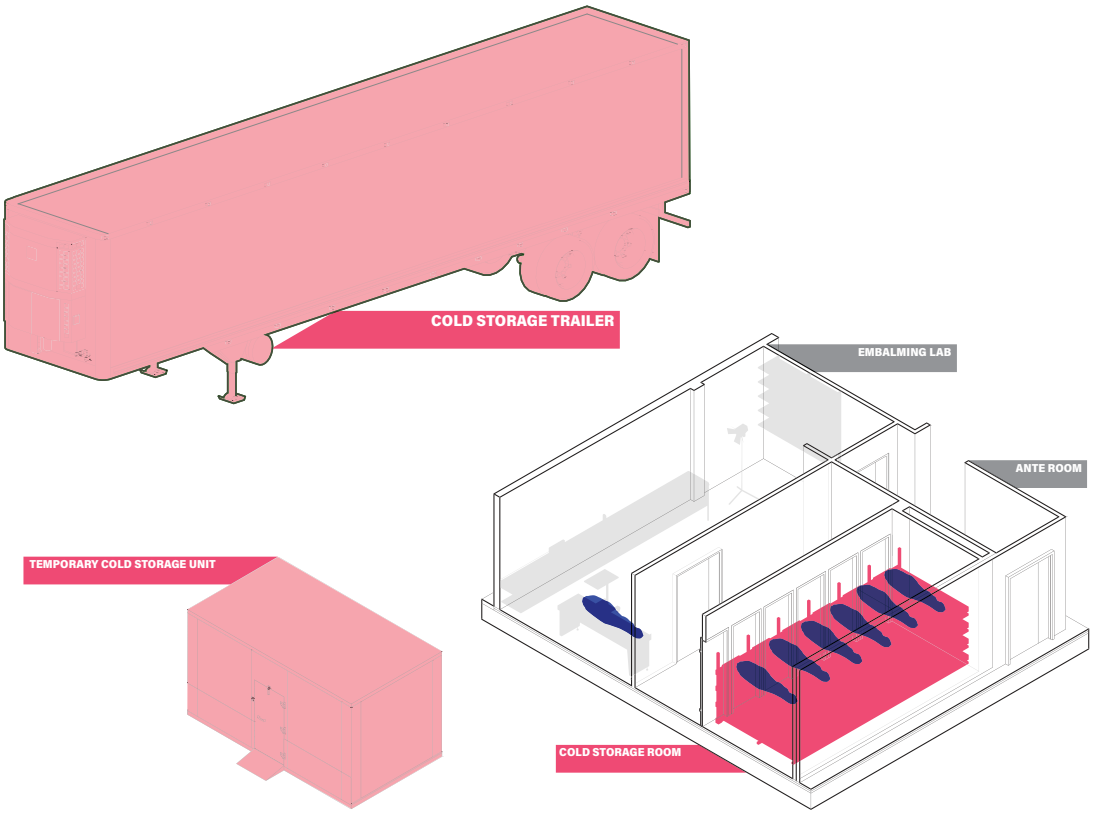


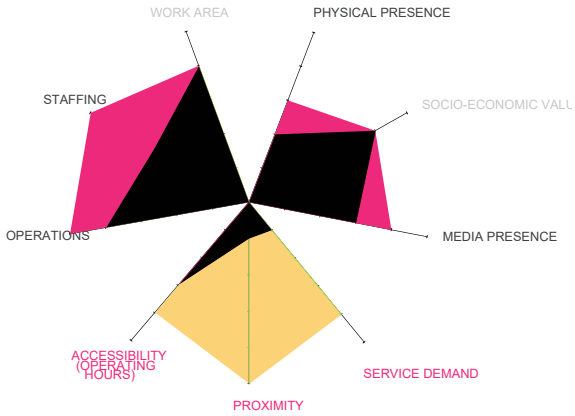
Fig 3-26 Changes documented in morgues and funeral homes during Acute Crisis No.1

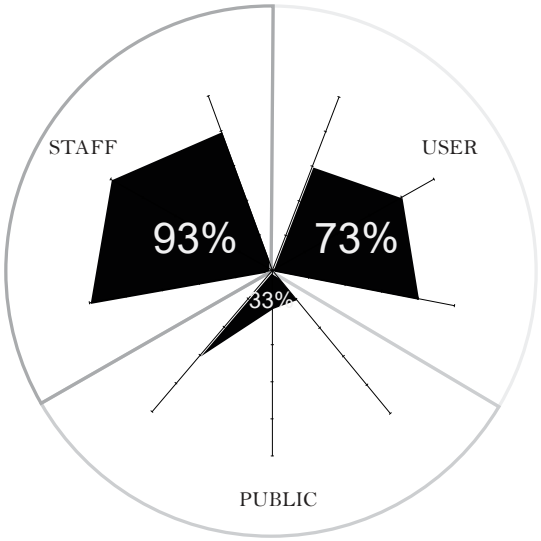
Left: use of cold storage trailers outside facilities and temporary morgues to supplement storage capacities
Right: overflow inside morgues and stockpiling of bodies

40 Patton, A.: Collaborative emergency management. In: Waugh, W.L., Tierney, K.J. (eds.) *Emergency Management: Principles and Practice for Local Government. International City/* County Management Association, Washington, D.C (2007)

41 Andrew, S., Carr, B.Z.: *Mitigating uncertainty and risk in planning for regional preparedness: the role of bonding and bridging relationships. Urban Stud.* 50(4), 709–724 (2013).

LONG-TERM CARE





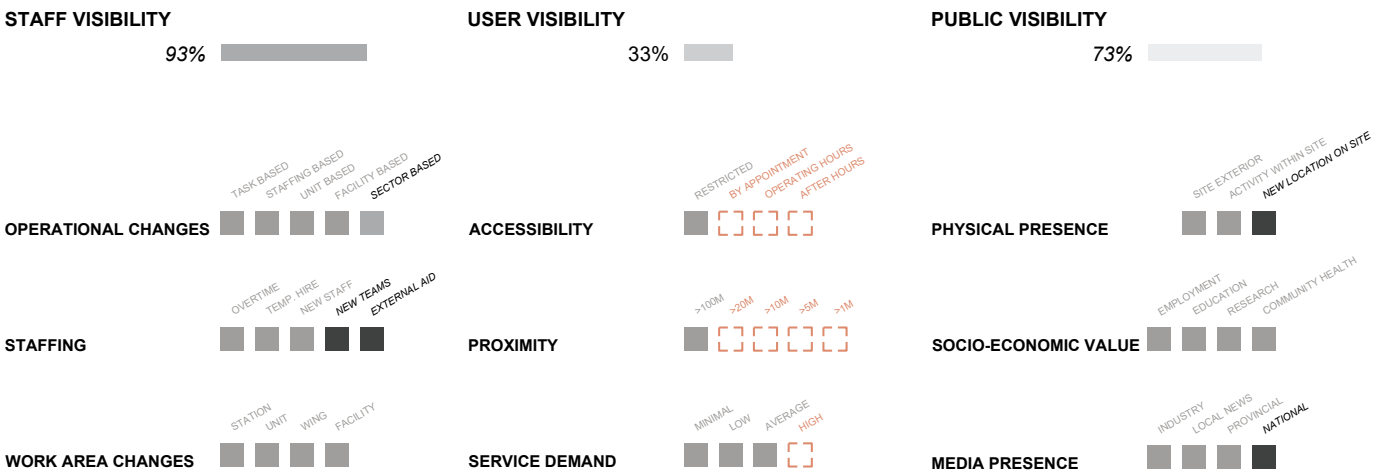
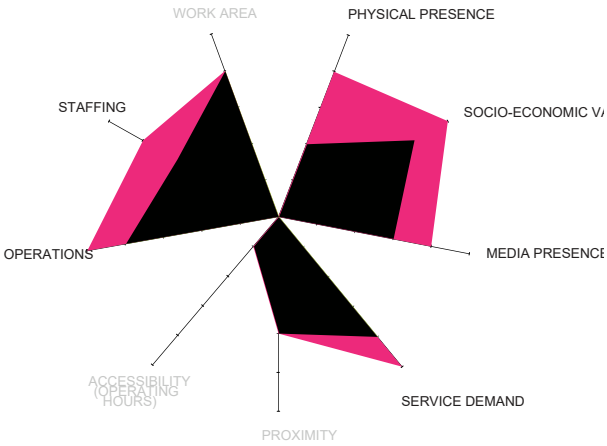
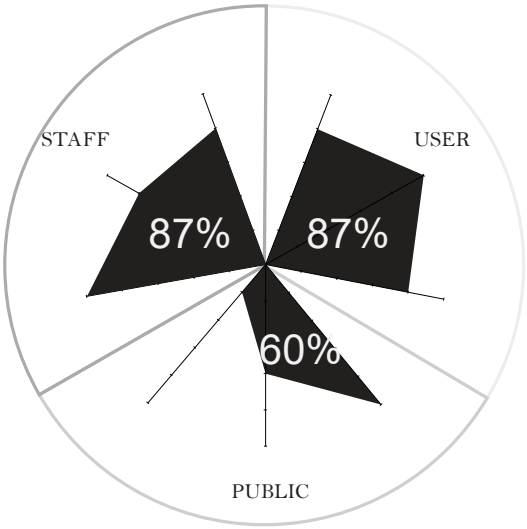


Fig 3-27 Changes in long-term care home visibility after the first acute crisis

MORGUE





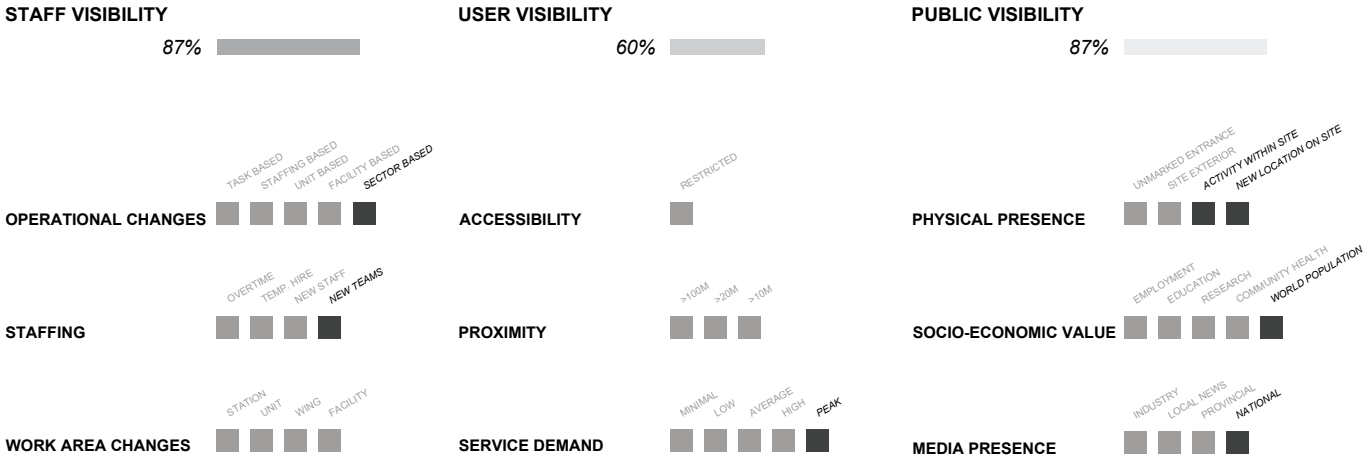
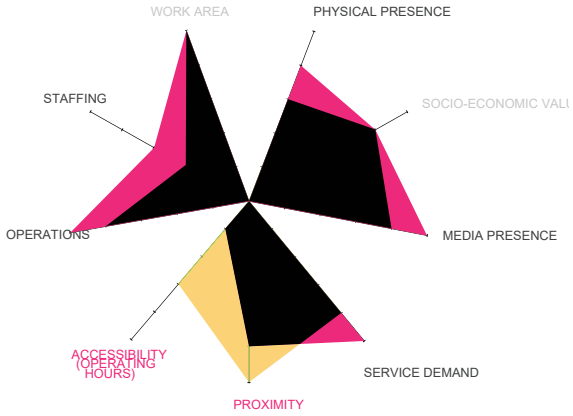
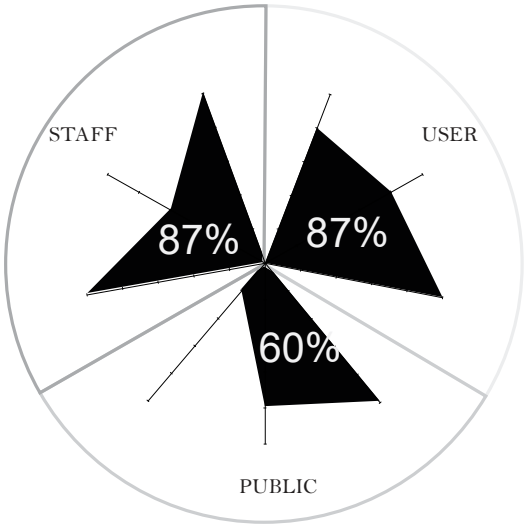


Fig 3-28 Changes in morgue visibility after the first acute crisis

FUNERAL HOME





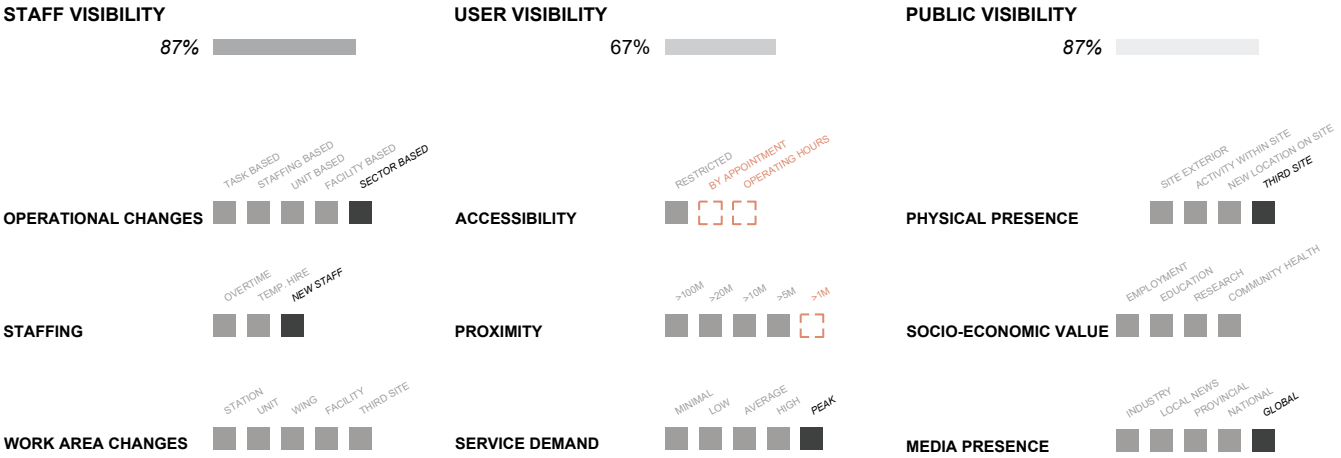


Fig 3-29 Changes in funeral home visibility after the first acute crisis

Part 4

AD-HOC SOLUTIONS AND THE NEXT ACUTE CRISIS

TEMPORAL INTERVENTIONS

Historically, institutions within the deathcare system have operated under precarious conditions due to the time-sensitivity of procedures, spatial restrictions, and a lack of resources and external support. While most hospitals have been designed to serve younger demographics and treat short-term acute illnesses, the elderly are most likely to experience chronic and medically complex conditions requiring different treatment [42].Among the government deficiencies in resource management, the pandemic has also highlighted the design community's disparaging priority in healthcare facilities over deathcare. This popularized interest has allowed for expansion of existing ICU capacities and has undoubtedly been critical in alleviating pressures off healthcare systems. While the previous section examined the timeline of events prior to the current pandemic, the following section reviews the various ad-hoc measures developed by different sectors and gives further insight to their impacts through narratives from affected stakeholders. Although unprecedented death rates created by the pandemic have pushed at-capacity units to create temporal solutions, these measures mey not be impermanent as we near an unprecendeted era of an aging population.

To date, Ontario and other Canadian provinces have been able to find solutions to temporary body shortage despite overflow at local morgues, but the likelihood of a future Mass Fatality Incident (MFI) overwhelming Toronto's mortuaries is a reality. Compared to smaller neighboring regions, such as Ottawa and London, the erection of temporary facilities for Toronto deathcare will be a more significant threat due to the city's spatial limitations, its near-capacity, and over-worked mortuary system, and the unpredictable extents of physical and mental health impacts increasing morbidity and mortality." While measures to address mass fatality events have varied across sectors, a standardized approach must be developed for future epidemics where spatial constraints continue to remain.

Fig 4-1 Illustration of mass graves in Brazil, 2020

Nossa Senhora Aparecida cemetery where new graves have been created in Manaus, Brazil, in May 2020

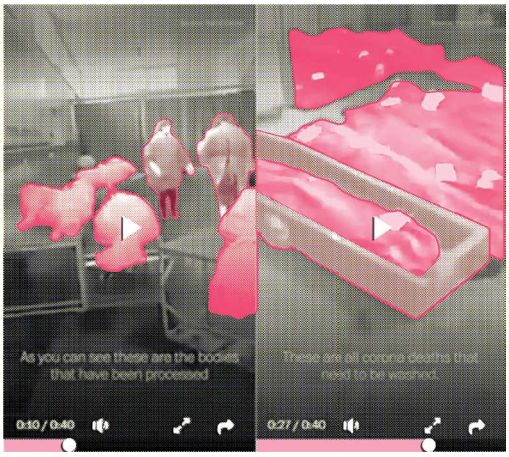


Fig 4-2 Illustration of Iran's graveyard stockpiling bodies in 2020

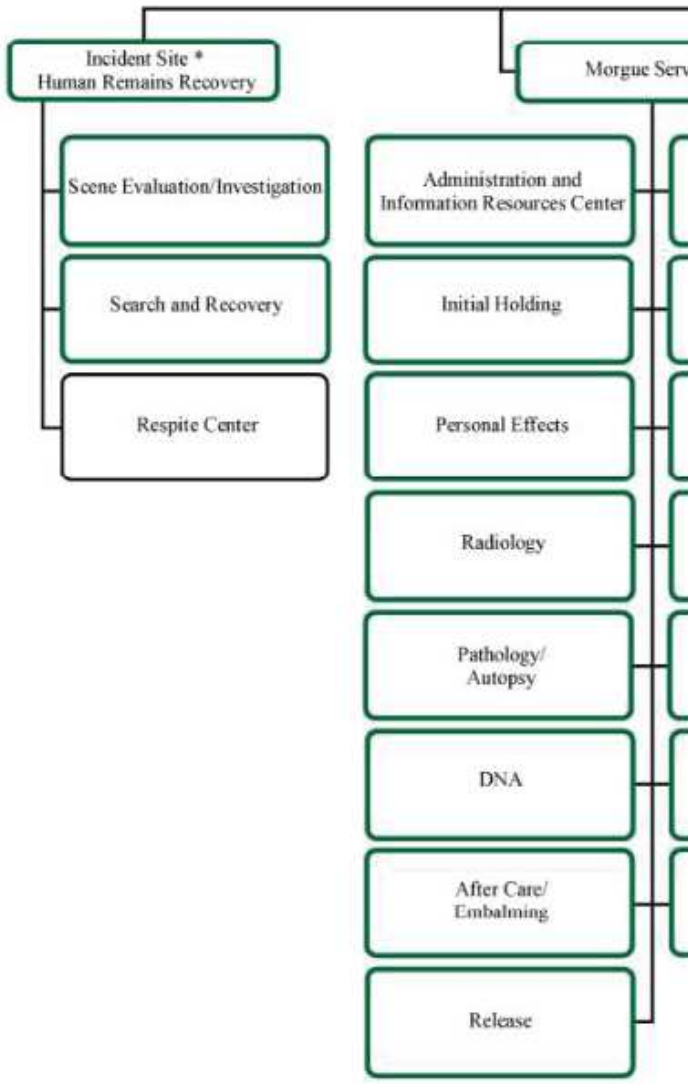
In May 2020, a viral video by a reporter was leaked documenting Iran's Qom over-capacity graveyard where bodies were stock piled in the facility for 4 to 5 days awaiting to be washed before burial

42 Song Z, Ferris TG. *Baby Boomers and Beds: a Demographic Challenge for the Ages. J Gen Intern Med.* 2018 Mar;33(3):367-369. doi: 10.1007/s11606-017-4257-x. Epub 2017 Dec 22. PMID: 29273896; PMCID: PMC5834972.

The checklist developed by the Pan American Health Organization (PAHO) aims to serve as part of any National Disaster Management Plan, and is based on the London Resilience Mass Fatality Plan 2006.[43] The checklist aims at providing the essential elements that should be addressed by ministries of health or disaster management offices in their own development of a mass fatality plan. Essential elements include the following: outlining the purpose and scope; activation process; command and control amongst local health;, law enforcement and NGOs etc; logistics for communication and transportation; welfare and provisions for affected persons; identification and notification; international dimensions that involve foreign bodies; site clearance and recovery of deceased victims; mortuary arrangements for storage and body preparation; disposal and final arrangements; chemical, biological, radiological, nuclear (CBRN) disaster procedures; public information and media policy; health and safety; and disaster mortuary plan.

> *"It is important that countries conduct regular exercises based on their plans to evalutae organizational capability to implement the plan (or part of it) and to promote preparedness"* [44]

Although the checklist gives a comprehensive recommendation on the preparations a nation should have, it is ultimately up to each government to conduct regular exercises to evaluate its capability. In relation to mortuaries and management of similar facilities, it does not provide specific dimensions, spatial requirements but instead a logistical recommendation that such facilities should be locally accessible, be equipped to document and store, have a readily available procedure and contact list, have temporary options in consideration and as a general principle - hospital mortuaries should not be used.



43 *"Mass Fatality Plan Checklist."* Pan American Health Organization, 2022. https://www.paho.org/en/health-emergencies/mass-fatality-plan-checklist.

44 *"Mass Fatality Plan Checklist."* Pan American Health Organization, 2022. https://www.paho.org/en/health-emergencies/mass-fatality-plan-checklist. pg.5

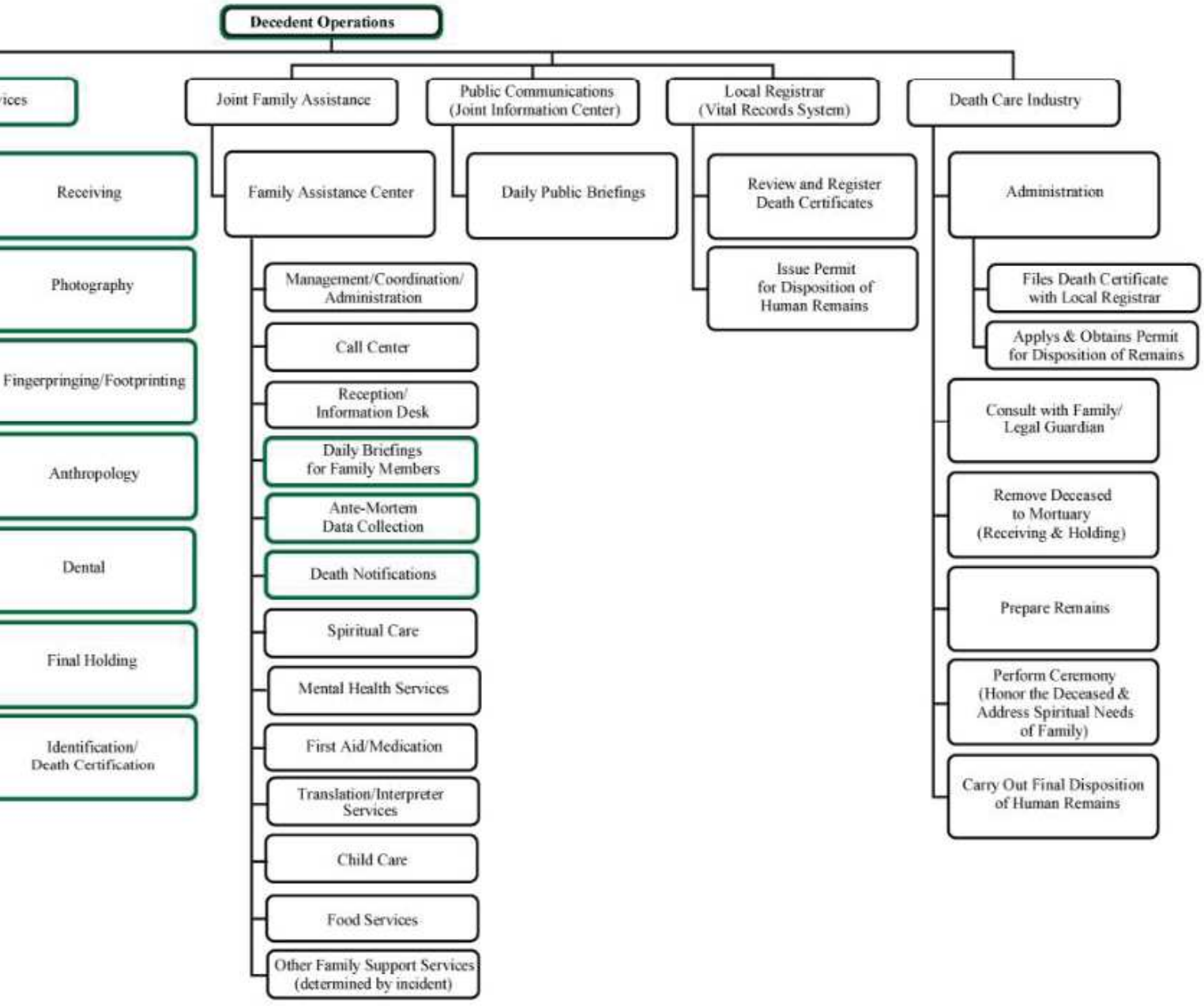


Fig 4-3 Sample Organizational Chart for MFI Legislation from PAHO

TEMPORARY COLD STORAGE SOLUTIONS

In 2021, and as the world enters its third year of the Covid-19 pandemic, death rates have dropped significantly from peaks experienced in previous waves. [45] However, physical remains still stand in various ad-hoc constructions that address a common problem - the shortage of storage space within hospitals and regional morgues for the deceased.

Fig 4-4 Picture of temporary morgue at Windsor Regional Hospital in January 2021

A grey minivan belonging to a local funeral home parks in front of a storage container that's been converted into a temporary morgue at the rear of Windsor Regional Hospital Met Campus in Windsor, Ont., Wednesday, January 6, 2021.

DESIGN CONSIDERATIONS FOR BODY HOLDING

Hospital morgues are tasked with body holding until their release to families, and require temperature controlled refrigerated spaces, such as walk-in cool rooms for individual trolleys or a bank of refrigerated cabinets. When planning for these units, the International Health Facility Guidelines (IHFG) highlights three essential aspects to consider[46]:

1. security of bodies;
2. isolation and bariatric needs; and
3. expected length of time for retention of bodies

While it is reccomended that hospital morgues be located nearby, or with direct access to an exit lobby, ground floor real estate is often dedicated to emergency units or administrative services, with morgues located below ground. When bodies are ready for release, funeral staff or morgue attendants deliver the body from the morgue holding area to the exit lobby where a transfer vehicle awaits.

FUNCTIONAL REQUIREMENTS FOR REFRIGERATED CHAMBERS

Controlled temperatures are maintained using one of two type of cold chambers: positive temperature cold chambers or negative temperature cold chambers. Positive temperature chambers allow refrigeration at +2/+4°C and are the most common in hospital morgues and funeral morgues; negative temperature chambers allow refrigeration at -15°C/-25°C and are needed at forensic pathology units to preserve the body as evidence. Beyond their technical requirements, functions of refrigerated spaces should allow for:

1. Separate spaces / cabinets should be allowed for isolation;
2. Manoeuvring space in front of refrigerated cabinets to insert/withdraw the trays;
3. 3 square metres is required for a body on a loose tray or trolley in a cool room.

Other considerations to account for include the impact of finishes, surfaces and fittings on safety, such as floor covering selection, adequate drainage, protection from protrusions or sharp edges, and stability and height of equipment or fittings, and adequate protection against infection and any other hazards .

45 Samsung, Lok Wong, Benjamin Sommers, and John Orva. *"Reductions in Deaths and Hospitalizations Associated with COVID-19."* ASPE. Office of the Assistant Secretary for Planning and Evaluation, October 7, 2022. https://aspe.hhs.gov/reports/reductions-medicare-deaths-hospitalizations-covid-19-vaccinations-2021.

46 https://www.healthfacilityguidelines.com/ViewPDF/ViewIndexPDF/iHFG_part_b_mortuary_general

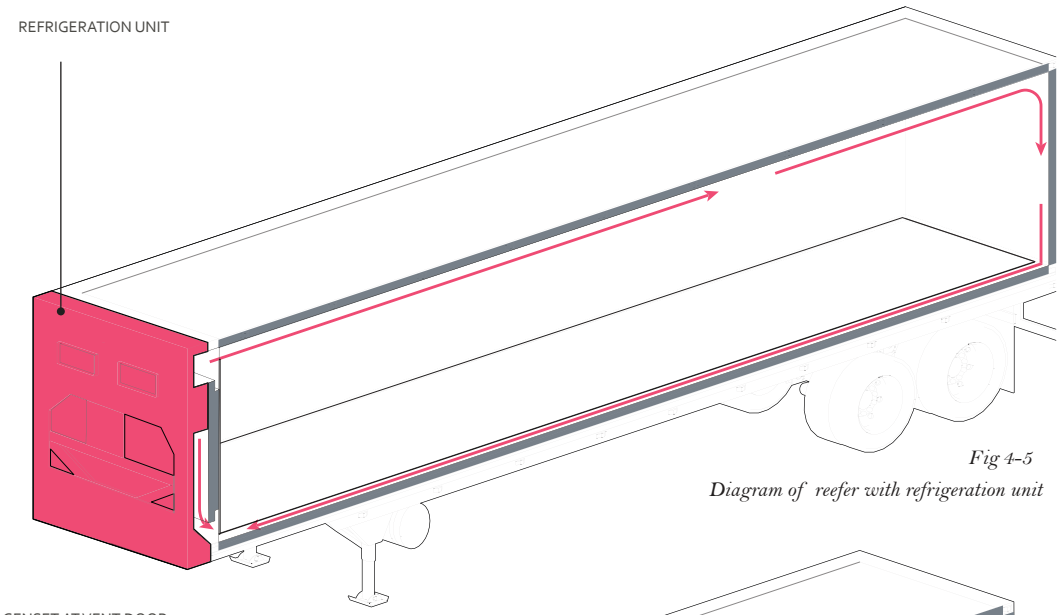


Fig 4-5

Diagram of reefer with refrigeration unit

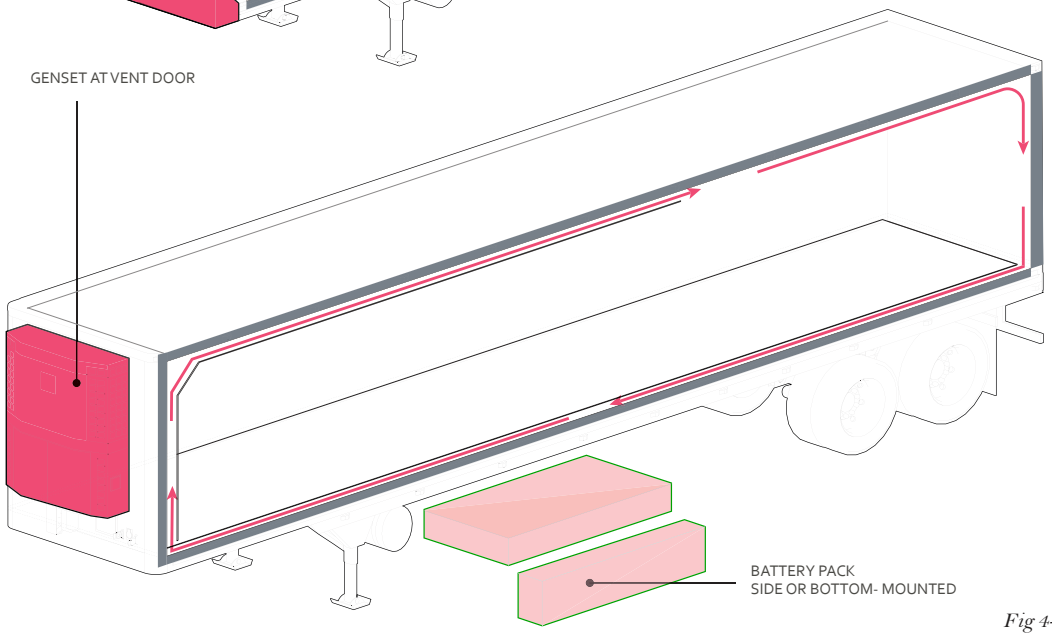


Fig 4-6

Diagram of reefer with Genset and battery box below

REFRIGERATED CONTAINERS AT HOSPITALS AND FUNERAL HOMES

"There's just not enough space... We've had to use the autopsy suites to place the deceased in until pathology takes care of it"

- Steve Masters, Funeral DirectorMasters Funeral Services in nearby Dorchester, Ont. [47]

Due to the shortage of space in hospital morgues and the temperature requirements that wouldnt be possible within other areas of the facility, refrigerated containers were employed as an ad-hoc solution. [48] Within Canada, the provine of Quebec was the first province to introduce the use of refrigerated containers. This was followed suit by London and Toronto, where as seen in Fig. 4-4 a shipping containers could be found in hospital loading or parking areas.

47 Butler, Colin. "Morgue Trucks Might Be New but London's Capacity Issue Isn't, Say Funeral Directors | CBC News." CBCnews. CBC/Radio Canada, January 6, 2021. https://www.cbc.ca/news/canada/london/london-ontario-1.5862344.

48 Rss, Selena. *"Refrigerated Mobile 'Morgue Trucks' Are Again in Use in Montreal."* CTV News, January 6, 2021. https://montreal.ctvnews.ca/refrigerated-mobile-morgue-trucks-are-again-in-use-in-montreal-1.5256236?cache=urztwihxzglnbw%3Fot%3DAjaxLayout.

While shipping containers have historically been used in the shipping and transportation industry, those equipped with generators (see Fig. 4-5 and Fig 4-7) are typically used by meat packing and food supply companies. They are known as refrigerated containers, or reefers within the industry, and are designed for goods requiring a temperature controlled environment.Reefers come in typical depths of 20' or 40' and are powered by electricity. While electrical hookups can be external, some models have attached generators, or gensets, that regulate interior temperatures during transport (see Fig. 4-6)

Fig 4-7 Exploded Isonometric of Insulated Reefer
Blue arrow indicates direction of cold air flow within wall cavities of reefer

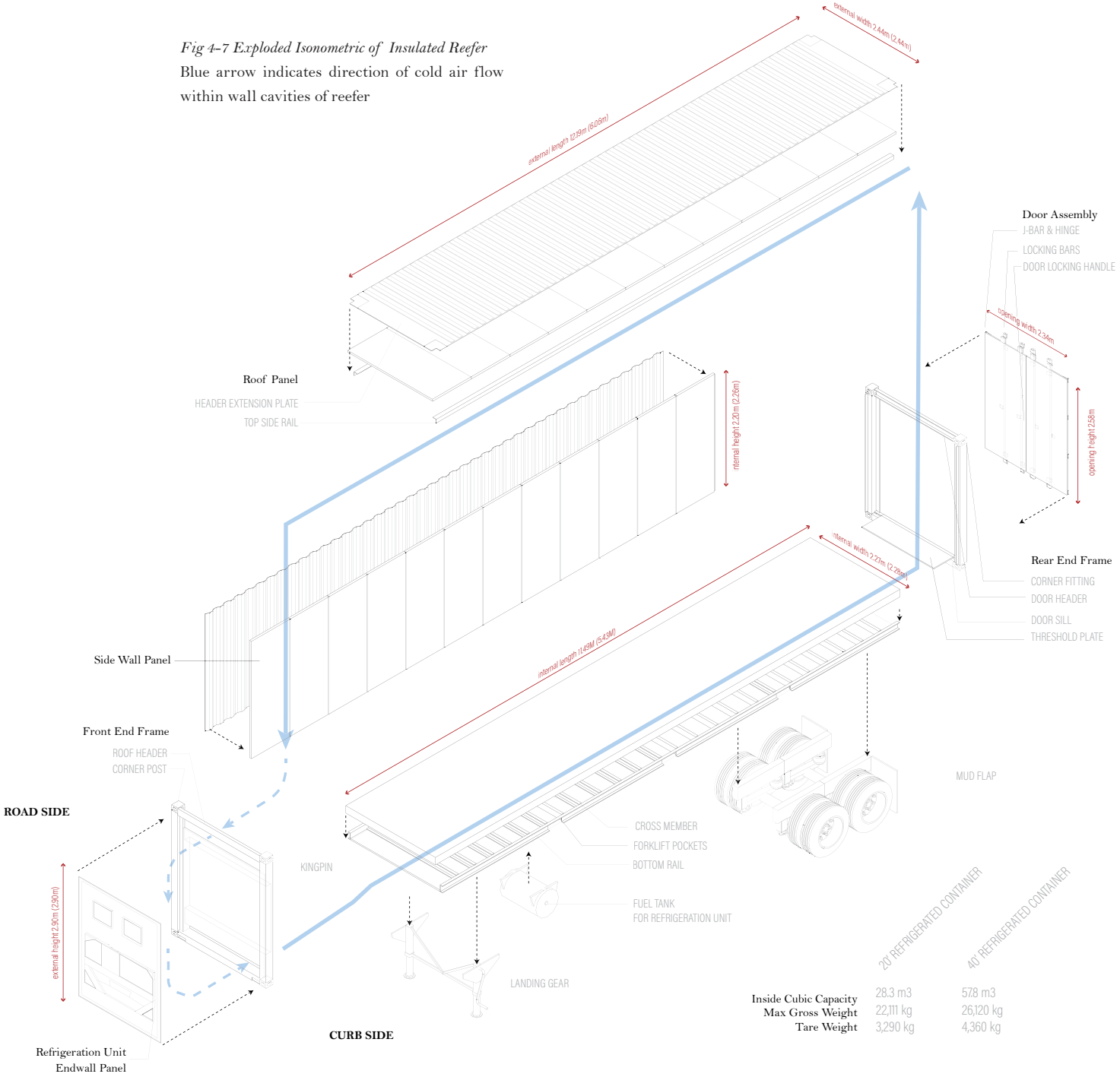
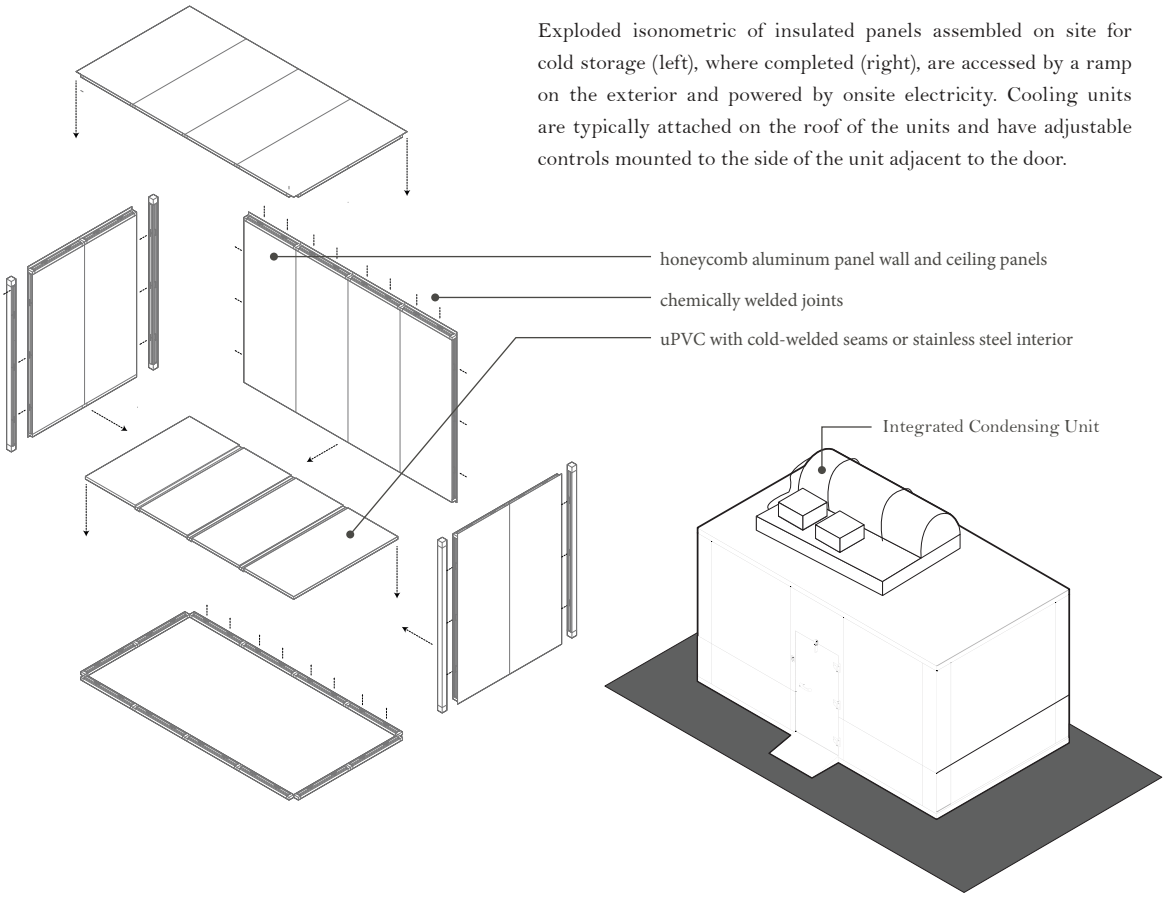


Fig 4-8 Illustration of prefab cold storage units



Exploded isonometric of insulated panels assembled on site for cold storage (left), where completed (right), are accessed by a ramp on the exterior and powered by onsite electricity. Cooling units are typically attached on the roof of the units and have adjustable controls mounted to the side of the unit adjacent to the door.

To address surge capacities, reefers have been retrofitted with attachable ramps on the exterior for loading access, and with body racks ,body trays, interior lighting to allow for temporary body storage Depending on the length of containers, either 20' or 40', units can store 16 bodies or 40 bodies, on 4 or 5 tier body storage racks. Due to the restructed width of reefers, maneuvering can be a challenge when transfering bodied onto and off of racks. In addition to the safety concerns of workers, there is also less control in the sterilization and climate temperature within as units are located outside of facilities and trolleys are brought through loading bays. An alternate solution available on the market are pre-fabricated environmental rooms (see Fig. 4-8). This may be a more suitable and permanent option should current units have available space for their installation as dimensions can be flexible and provides a more sterile and user-safe environment.[49]

"These alternative spaces for the management of remains have been used to ensure that we store COVID-19-related remains in a safe manner,...These refrigerated trucks simply allow the remains to be stored safely while waiting for the funeral services to come and collect them. We do not always use them, and they are used less than during the first wave." [50]

- Helene Bergeron-Gamache
spokesperson for the health authority for Montreal's West Island.

49 "Labworks International Modular Manufacturing Facility." Environmental Rooms Manufacturers - Labworks International Inc., Labworks International Inc., https://www.labworksinternational.com/modular-manufacturing-facility.

50 Ross, Selena. *"Refrigerated Mobile 'Morgue Trucks' Are Again in Use in Montreal."* CTV News, January 6, 2021. https://montreal.ctvnews.ca/refrigerated-mobile-morgue-trucks-are-again-in-use-in-montreal-1.5256236?cache=urztwihxzglnbw%3Fot%3DAjaxLayout.

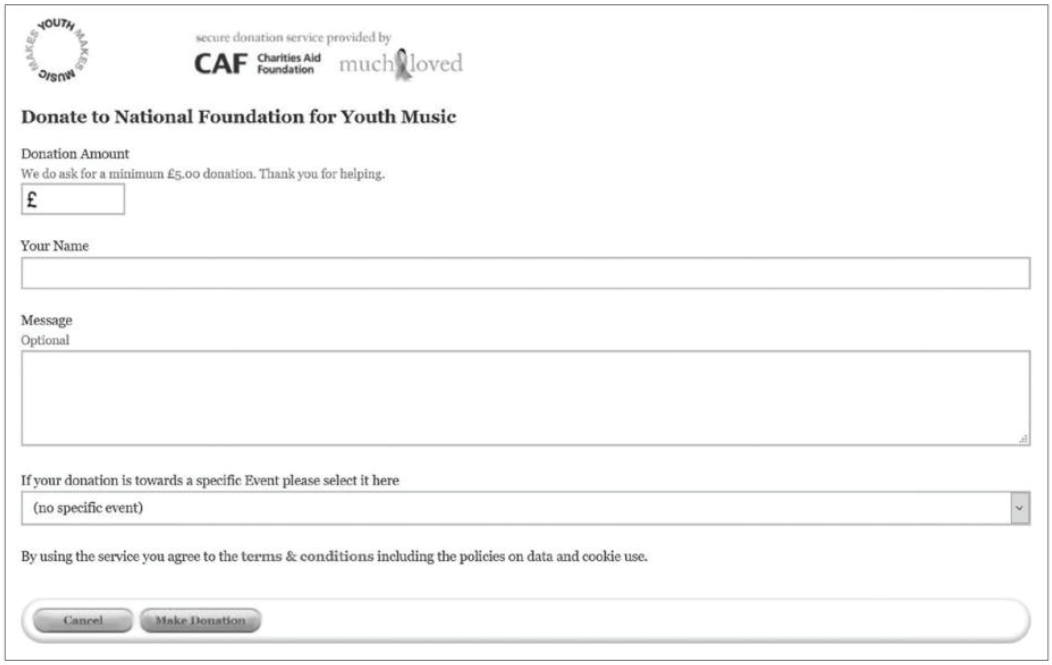


Fig 4-9 Interface for the online donation at MuchLoved

VIRTUAL AND ALTERNATIVE BEREAVEMENT SERVICES

Prior to the pandemic, there existed an emerging trend of online memorial platforms stemming from the electronic era, At the University of Bucharest, Doctoral School of Sociology candidate, Stefania Matei, discusses how interaction design shapes the posthumous presence of a person in the world. [51] Using the donation platform Much Loved - The online Tribute Charity (see Fig 4-9) as an example, she explores the socio-technical organization of a commemorative donation. She argues that a specific form of collective moral agency is accomplished in the digital memoriam and by doing so, a mode of being posthumously engaged with the world is actualized and therefore deceased persons are constructed as sharing a responsibility for the world with the living.

51 Matei, Stefania. "*Status after Death. Understanding Posthumous Social Influence through a Case Study on the Christian-Orthodox Tradition.*" Journal for the Study of Religions and Ideologies, December 2016. https://www.researchgate.net/publication/311387451_Status_after_death_understanding_posthumous_social_influence_through_a_case_study_on_the_christian-orthodox_tradition.

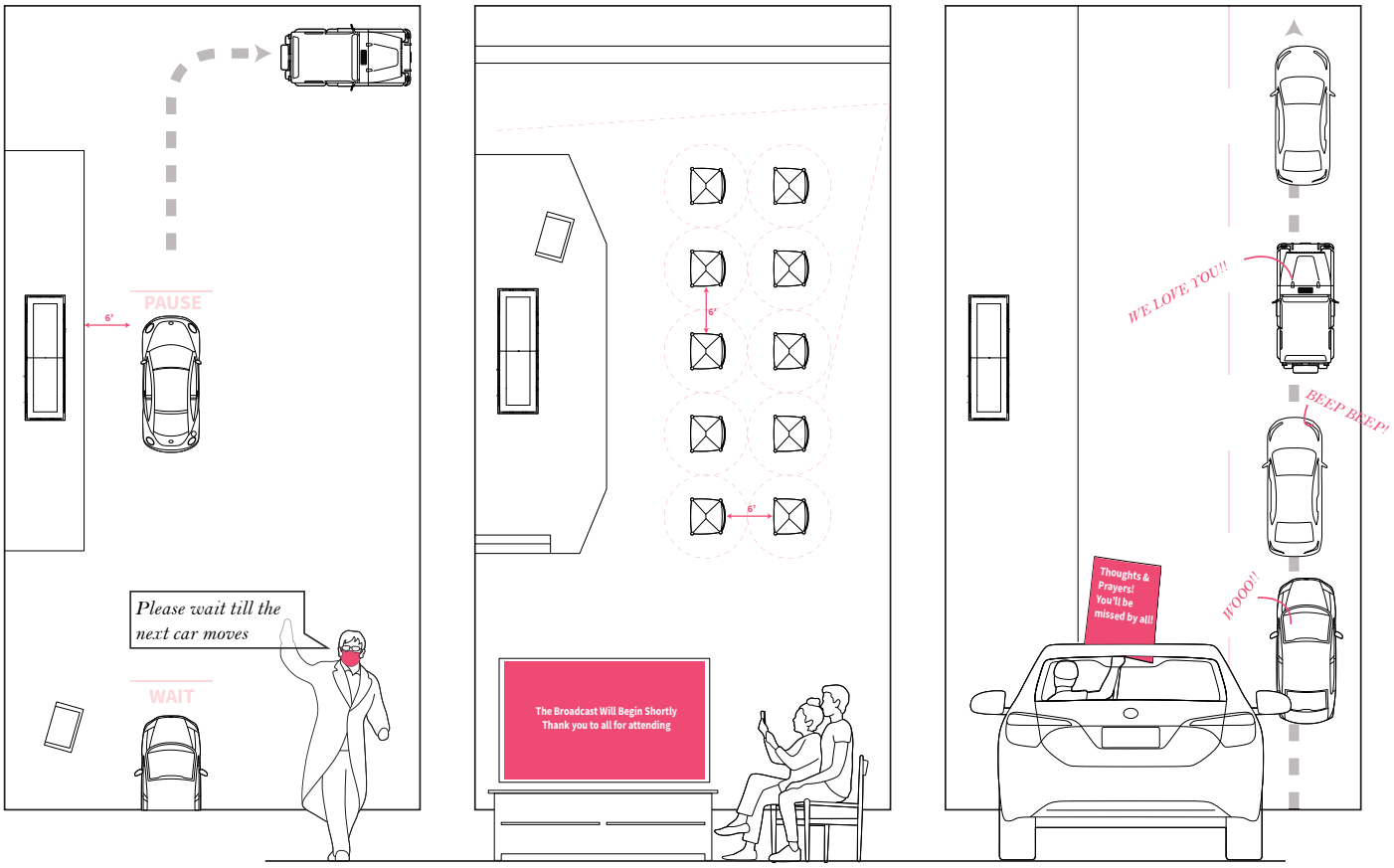


Fig 4-10 Diagram of socially distanced funeral services emerging from COVID-19

While this was not a service provided by most funeral operators prior to the pandemic, it soon became one that many families were forced to explore due to the elimanation and restrictions of in-person gatherings. For Ontario bereavement facilities that had to pivot in response to provincial mandates, alternative means to hold services were employed. Mandates required guests as well as workers to be socially distanced whether indoors or outdoors, and further restrictions on number of people in attendance, staff included. From Fig 4-10, new modes of memorial include:

1. Drive-Thru Visitations - Outdoor Visitations Set-up through Stations
2. Broadcasted Services - Social Distanced Seating with Services Recorded for Broadcast
3. Rolling Processions - Rotating Queu of Guests in Vehicles

The following section outlines the three most prominent forms of services witnessed during the pandemic: and illustrates the unique experiences of attendees, families and staff that were present

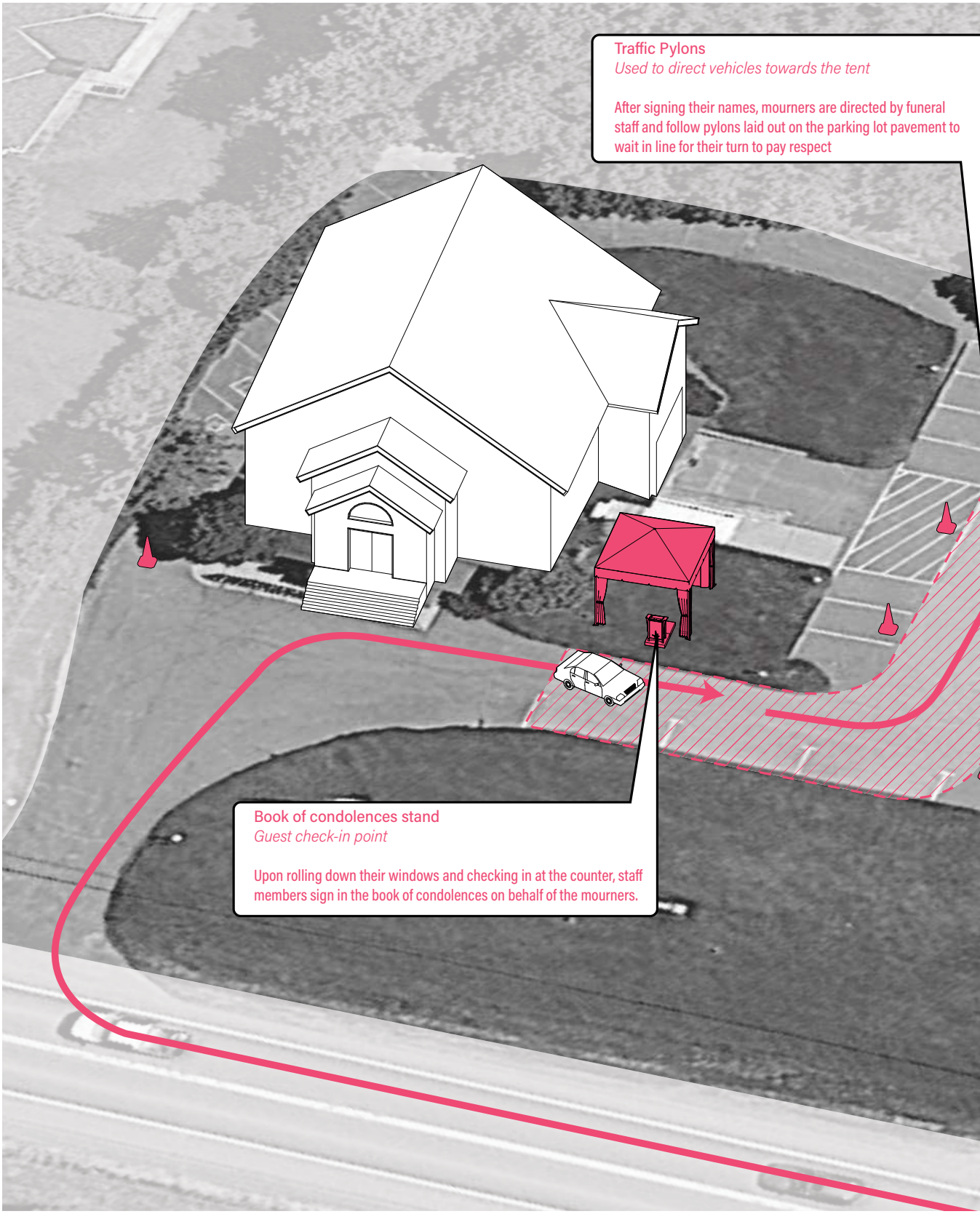


Fig 4–11 Diagram of funeral home parking lot adapted for an outdoor drive-thru service


Outdoor drive-thru visitation
In observance with provincial guidelines that allow for larger gatherings if services are outdoors (50 people vs 30% capacity)
Canopies are used to provide privacy and shelter for those under the tent. This is space reserved often for the casket and surrounded by family members, flowers and portraits of the deceased.
Distanced viewing station
Socially distanced area designated for mouners to pause
Although seperated by pylons, guests are able to see the casket and roll down their windows to pay respect to the family. Depending on the service, visitors are allotted a certain time to pause in order to allow the next guest to proceed.
Podium
Where a eulogy is given by a minister/funeral director at a full drive-thru funeral service
For full services, cars may be directed to face a podium where a eulogy will be given and music is played through a dedicated FM radio station

DRIVE-THRU VISITATIONS

In July of 2020, mandates in Ontario allowed for outside and indoor gatherings but at reduced capacities. These limits enforced a maximum attendance of 50 people for outdoor functions, and 30 per cent capacity for indoor events, with maximums accounting for the combined number of guests as well as staff. [52]While restrictions at the time have eased since the earlier months of the pandemic, many families desired a more grand celebration to commemorate their loved ones.

"During the early days of COVID-19 with restrictions, the families were isolated at home, they're grieving on their own. So grief is always hard — could you imagine complicating it more with isolation?" [53]

- Bruno Carchidi, President of Tubman Funeral Homes

Fig 4-12 Illustration of guest arriving at drive-thru funeral in Ottawa

Funeral staff helps guest in car to sign Oven's book of condolences while maintaining social distance

In Ottawa, the Kars locataion of Tubman Funeral Homes hosted its first drive-thru ceremony was held for Jessie Ovens, a beloved great-great grandmother and a well known fixture in her small community of Kars.[54] Ovens died on June 10 f natural causes and had planned a traditional funeral planned for herself over 20 years ago. While current guidelines have eased prior restrictions on gatherings, bereavement facilities have not been able to hold larger ceremonies typical of the past. Noting the large community that Oven's would have wanted at her celebration, a reduced guestlist would not suffice and thus an alternative was proposed by the facility. The facility adapted the ceremony by incorporating the traditional aspects Ovens had initially envisioned . These included a book of condolences (see Fig. 4-12) , an opportunity for guests to pay respects to the family, an open casket viewing and eulogy led by a pastor (see Fig 4-13). As restrictions limited these activities to the outdoors and to a much smaller audience, operators fashioned their outdoorparking area into a drive-thru experience, where a rotating attendance would still adhere to the maximum allowable outdoor capacity.

"This drive-thru enables a large group ... the chance to say goodbye and to pay their respect to the family. So it does help ... because that connectivity is so important, and it strengthens their faith." [55]

- Bruce Peterskin, pastor leading Oven's service

52 *"Gathering Limits Increase for Stage 3."* AGCO, July 17, 2020. https://www.agco.ca/blog/general/jul-2020/covid-19-gathering-limits-increase-stage-3.

53 Johnstone, Hillary. *"Drive-thru Services Helping Families Grieve during Pandemic."* CBC News, July 1, 2020. https://www.cbc.ca/news/canada/ottawa/drive-thru-funeral-pandemic-covid-19-1.5631192.

54 Ibid

55 Ibid.

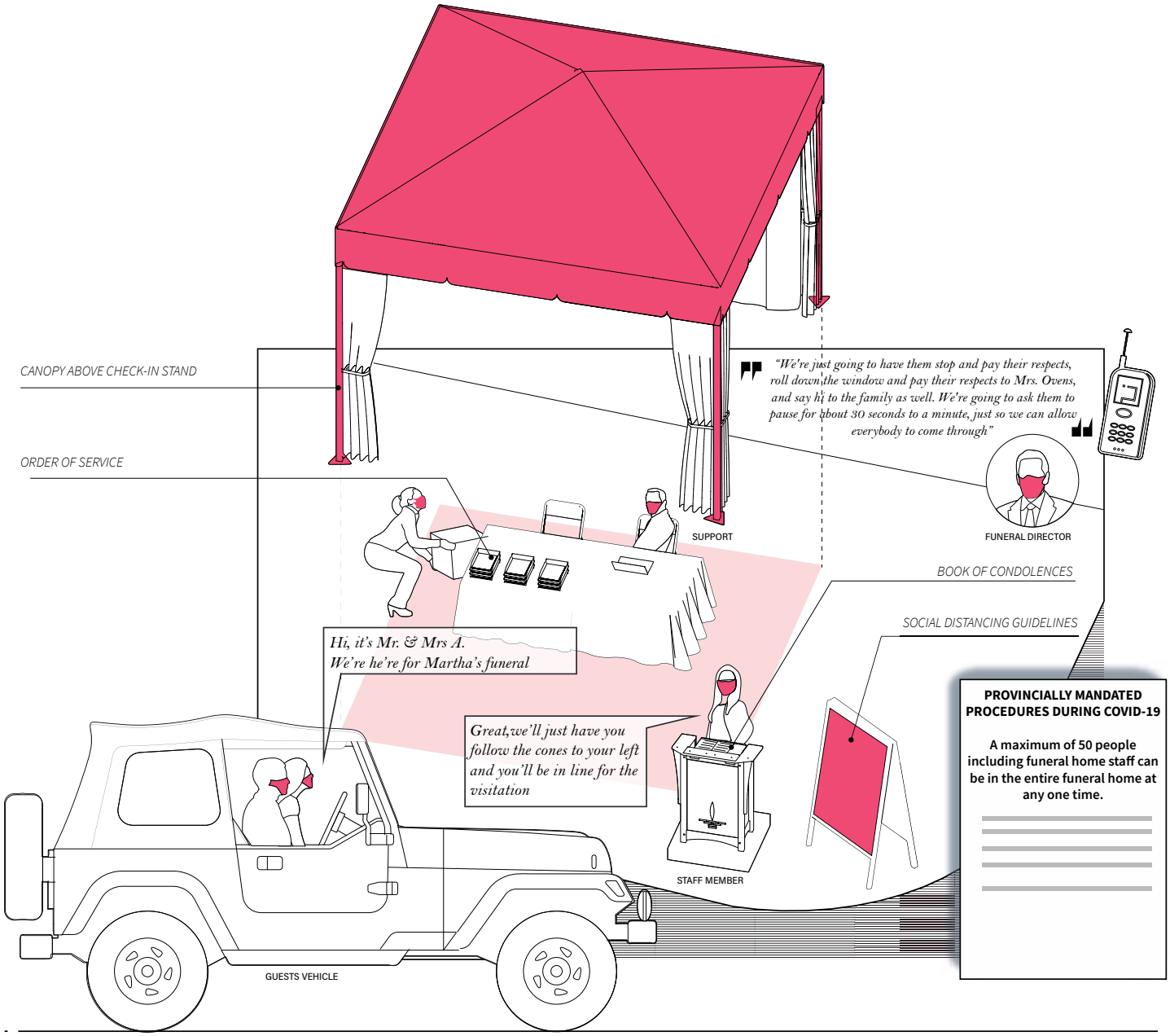


Fig 4-13 Illustration of guests arriving at a drive-thru visitation and directed by funeral staff to the next station

While typical activities would have been set-up inside the funeral home, each activity was created into a station where equipment and furnishings would be positioned under a canopy. This included pictures of Ovens, flower arrangements and decorations for the service, and furniture and refreshment stations for the immediate family. As vehicles followed the trail of pylons into a procession, staff stationed throughout the parking lot guided guests at each stop (see Fig 4-14) To help maintain social distancing, mourners are required to stay within their vehicles but are allowed to roll down their windows to speak with staff members.

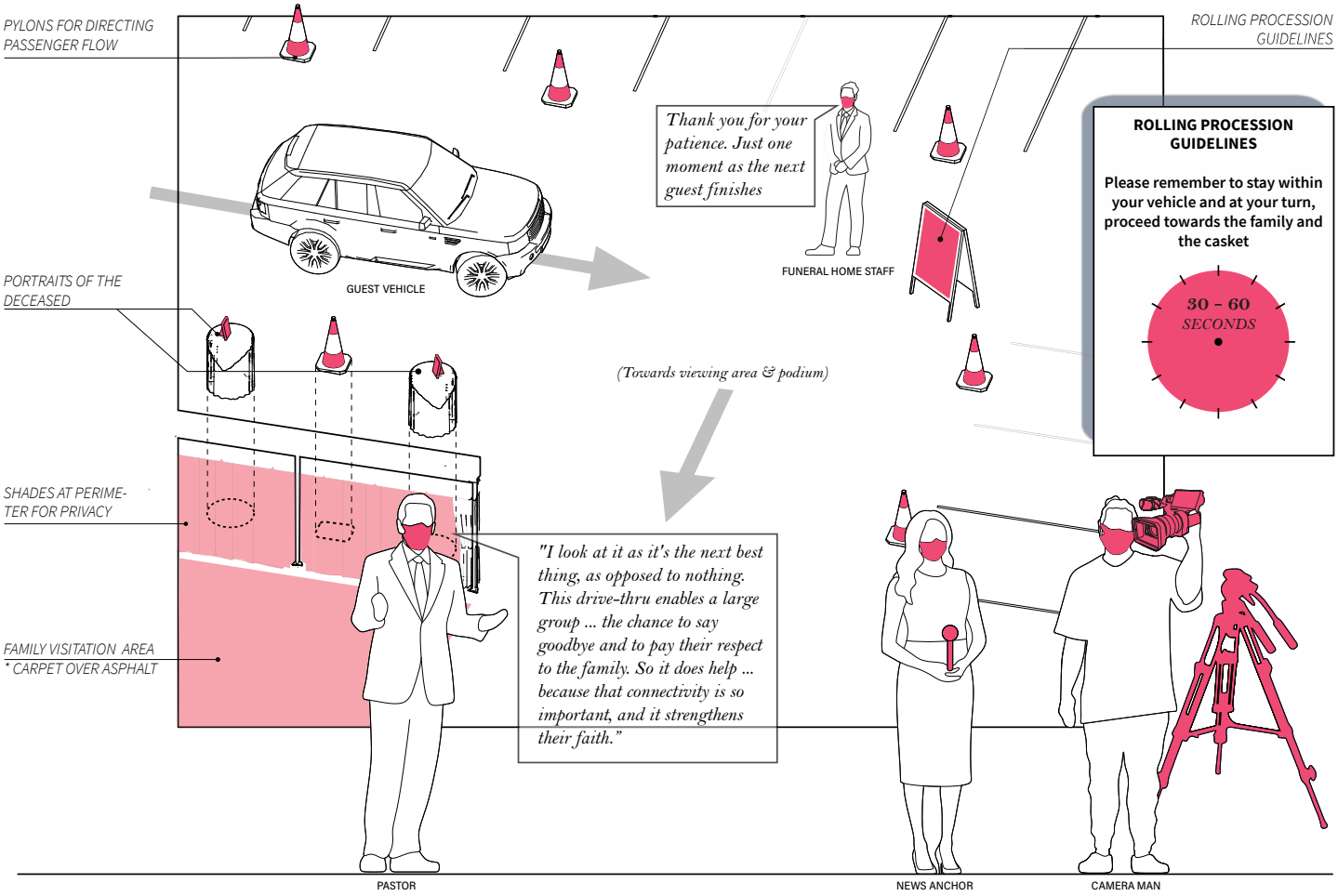


Fig 4-14 Illustration of Tubman Funeral Home parking lot with pylons and guidelines to direct guests

When paying respect at the casket, guests are requested to limit their stop and be mindful of the vehicles behind them. Allowing slots of 30 seconds to a minute, funeral homes such as Tubman are able to coordinate visits for a much larger group of guests while still adhering to bylaws. Other in-person activities such as signing in the book of condolences and delivery of eulogies were likewise adapted for the occasion. Funeral staff would sign on behalf of guests and readings by the pastor would be recorded and played through dedicated FM radio stations along with music.

While drive-thru services such as Ovens may not be how families and friends had envisioned or experienced before, they have helped bridge human connections despite unprecedented mandates. Families who delayed services in the spring due to COVID-19 restrictions have expressed a growing interest in drive-thru funeral services, and Ovens's family and others in attendance were grateful to not have to grieve in isolation.

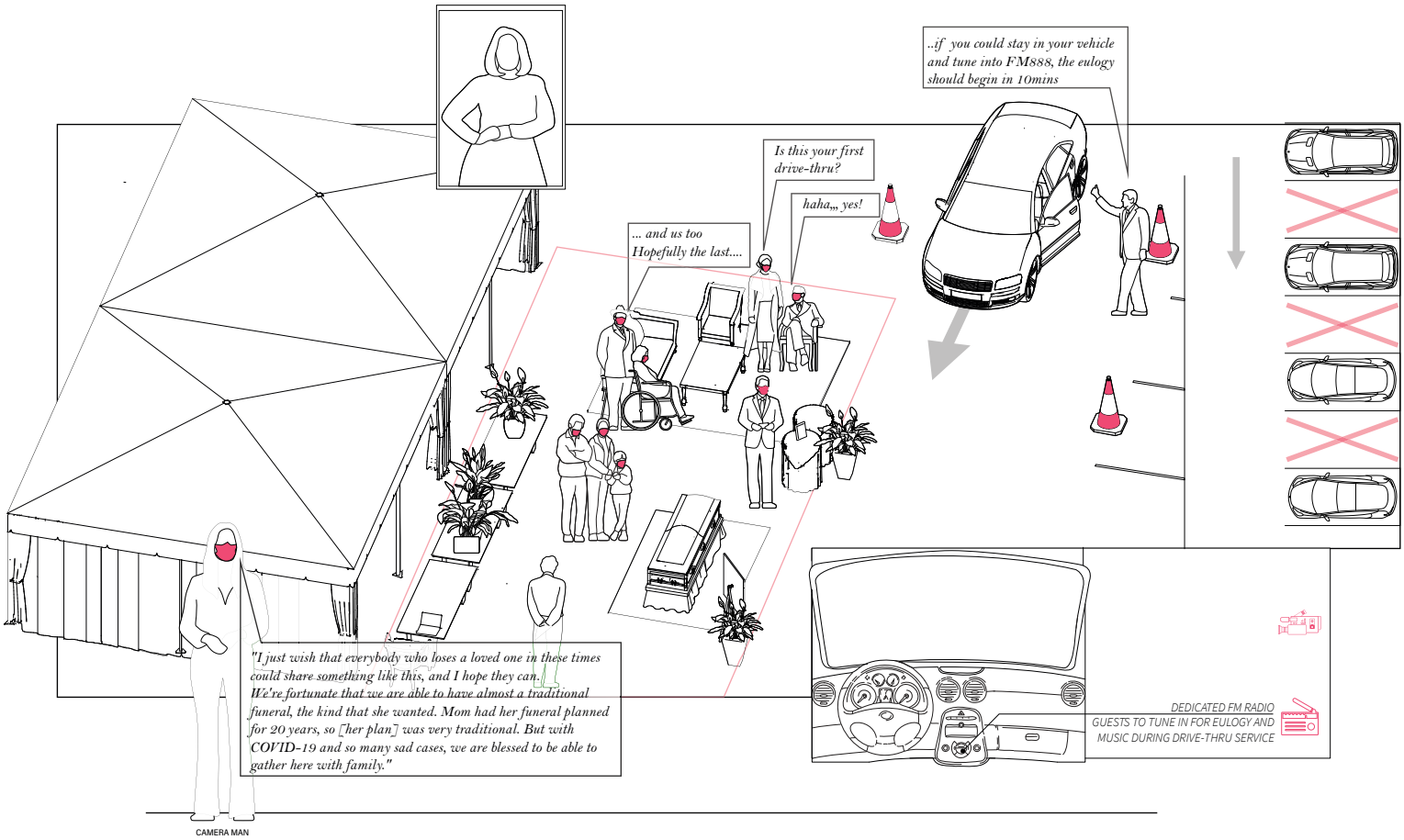


Fig 4-15 Illustration of Guests paying respects to Ovens' family and tuning car radio for eulogy

ROLLING PROCESSION

While rolling processions are not a new sight, services were often held by institutions and governments to include the public in commemorating the passing of a public figure such as war heroes, presidents or famous celebrities. While memorial services within communities would often be held in private, restrictions on in-person social gatherings have posed new challenges not only for the bereavement sector but also families and friends who wish to pay their respects in-person.

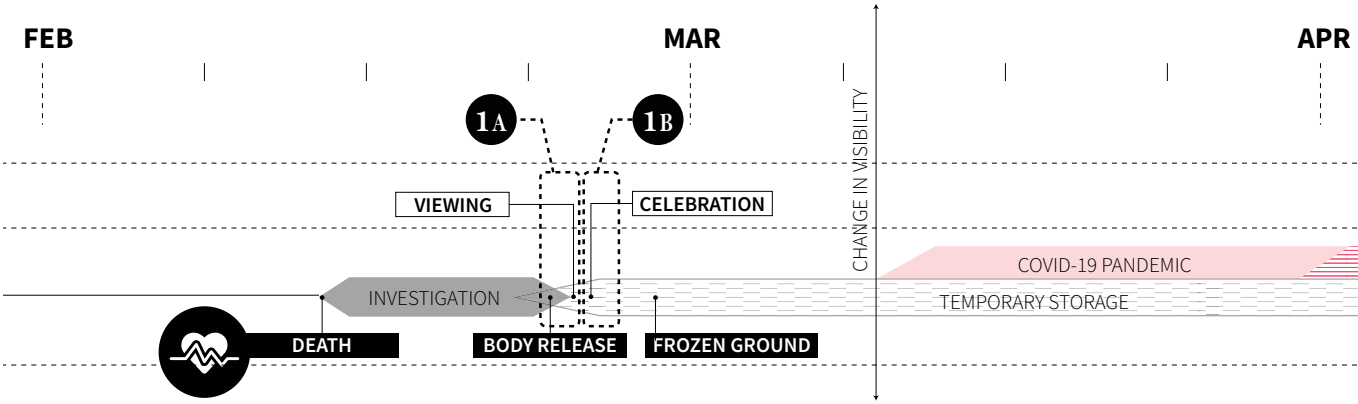


Fig 4-16 Timeline of memorial events for Ramolla in relation to COVID-19 mandates

In February 2020, the passing of Mark Ramolla was heartfelt in the Springwater Township of Barrie. Ramolla and his father were avid snowmobilers and were riding that day when his vehicle left the trail and struck a tree.Ramolla, who was only 14 years old at the time, was a passionate athlete and a dear friend to the many lives he touched. This was evident as condolences flooded from all corners of the internet upon announcements of the fatal incident (see Fig 4-18), and with over 1,000 in attendance at his celebration of life ceremony.

To commemorate the teen, the family arraanged a series of services (see Fig.4-16) This included guest visitations at the Adams Funeral Home, Barrie, on thursday, February 20; a celebration of life ceremony at Vespra Hills Golf Club, Minesing on friday, February 21; a private family internment at Minesing Union Cemetery in the Spring.(see Fig 4-18) While Ramolla's internment would be scheduled later in spring due to ground conditions, the outbreak of COVID-19 would also change these arrangements. [56] The private service would carry on as scheduled with only immediate family in attendance, but others who wished to pay last respects would risk breaching social gathering restrictions. Local mandates at the time (May of 2020) imposed a strict gathering size of only 10 people for outdoor events, approximately 1% of accounted guests from Ramolla's February celebrations. To adhere to regulations, family and friends coordinated a different way to be present. Using social media, details for the procession were quickly finalized, and local authorities worked with the family to coordinate access into the cemetery grounds (see Fig 4- 21)

56 *"MARK RAMOLLA February 24, 2005 - February 16, 2020."* Adams Funeral Home & Cremation Services, February 21, 2020. https://www.adamsfuneralhome.ca/obituaries/mark-ramolla/29872/.

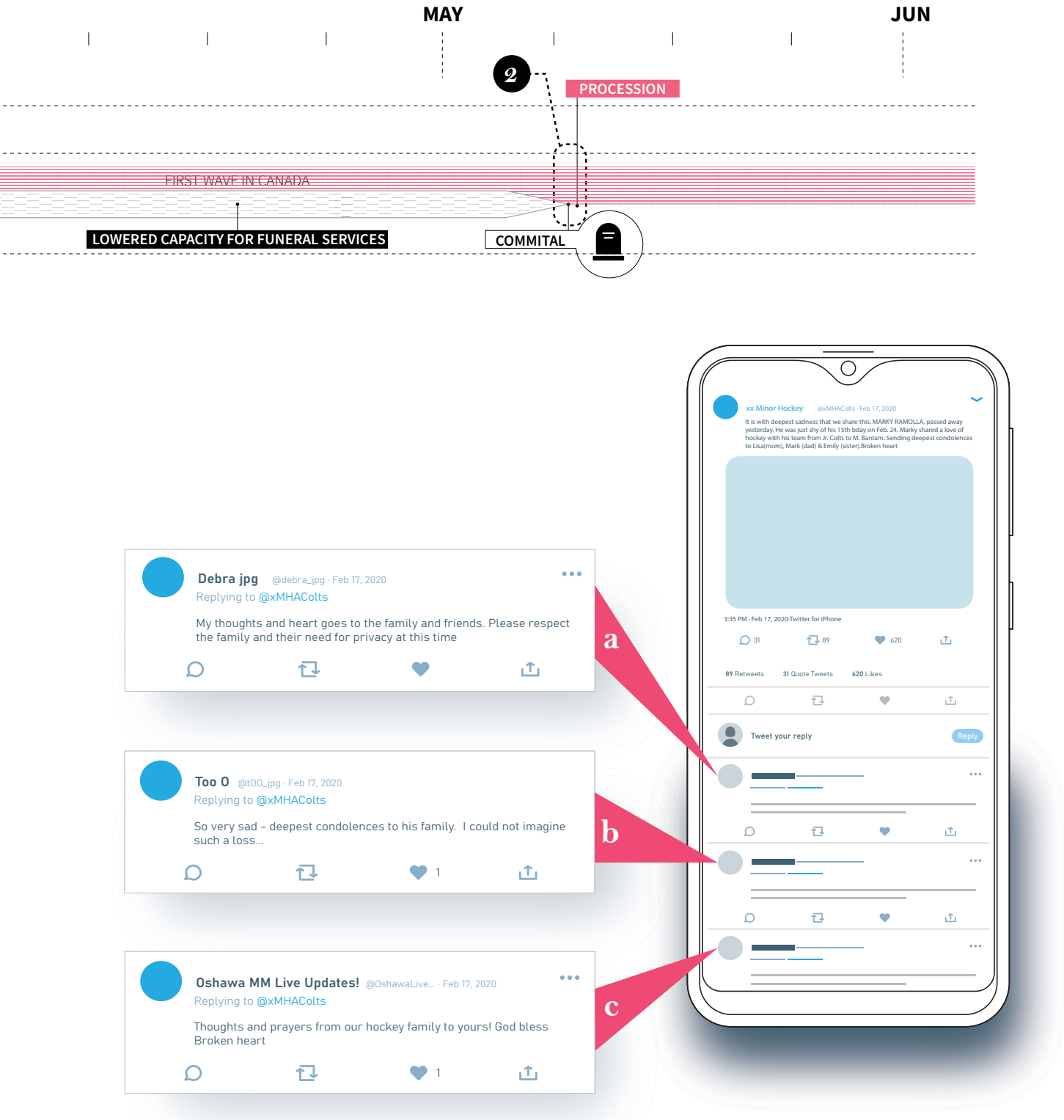


Fig 4–17 Illustration of social media postings in response to Ramolla's passing

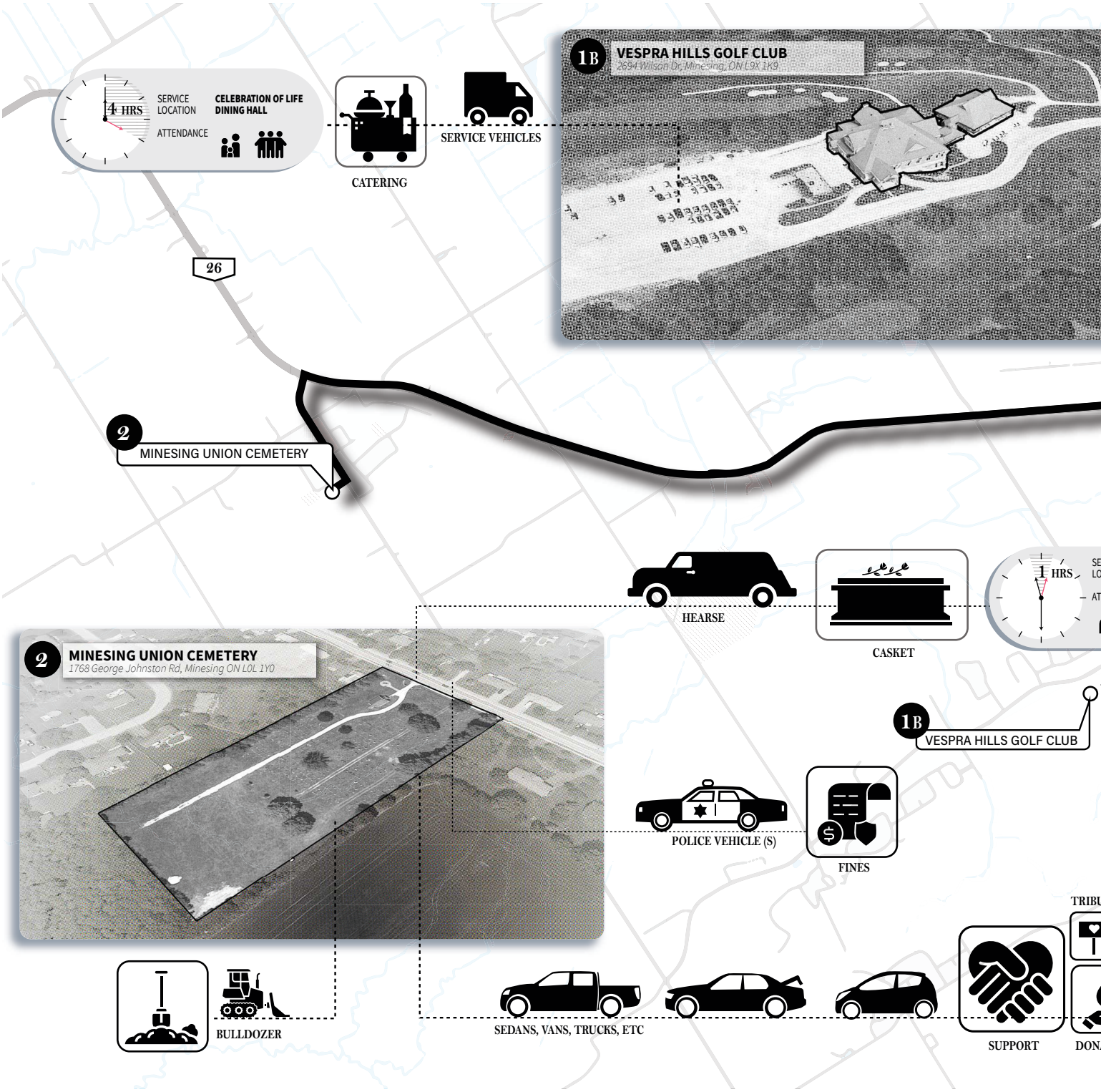


Fig 4-18 Illustration of memorial services held for Ramolla

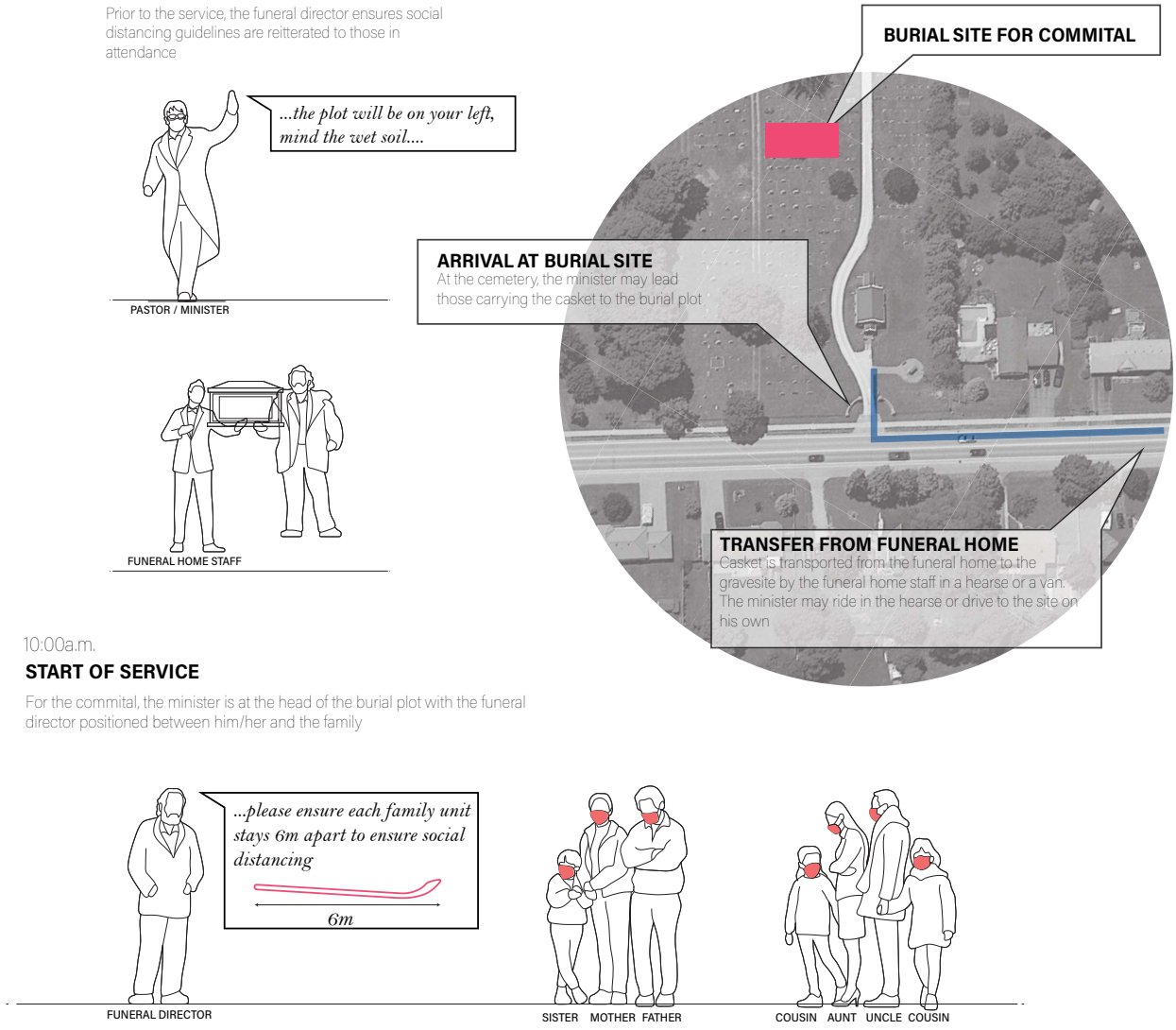


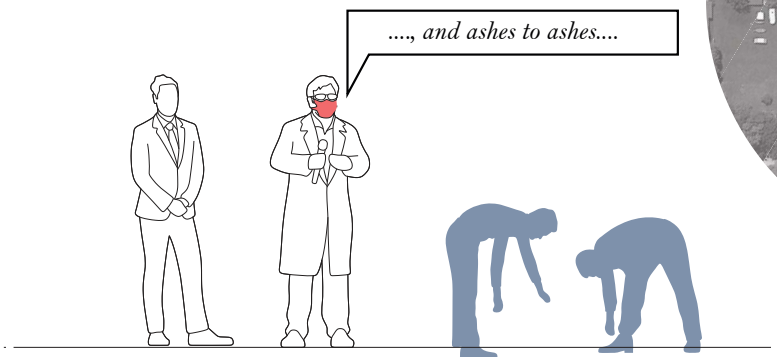
Fig 4-19 Illustration of events at start of commital

On the day of the commital, funeral staff and paul bearers deliver the casket from Adams Funeral Home to the the Minesing Union Cemetery Service begins at 10am with the immediate Ramolla family in attendance. The minister stands at the head of burial plot with the funeral director positioned between him and the family. (see Fig 4-19) Meanwhile, guests are instructed to make their way to the designated intersection (across from the cemetery) and to begin lining up their vehicles at 11:00am (see Fig 4-21) Overseeing this event are law eneforcement officers stationed at the gate of the cemeterey as they remind guests and families to keep socially distanced. Upon commital of the casket, remarks are given by the minister, and the private service ends at 11:30am. The funeral director and staff make preparations for arriving guests while the family remain at the graveside. The parade of vehicles waiting outside the cemtery are given the signal to start their engines, and the rolling procession makes it way through the cemetery as drivers and passengers pay their respects as they pass the graveside (see Fig 4-20)

COMMITAL & REMARKS

Words of comfort by pastor, or remarks from minister at the bequest of the family

After the commital, the family remains at the gravesite while the funeral director and staff help to ensure vistors abide by social distancing guideleines.



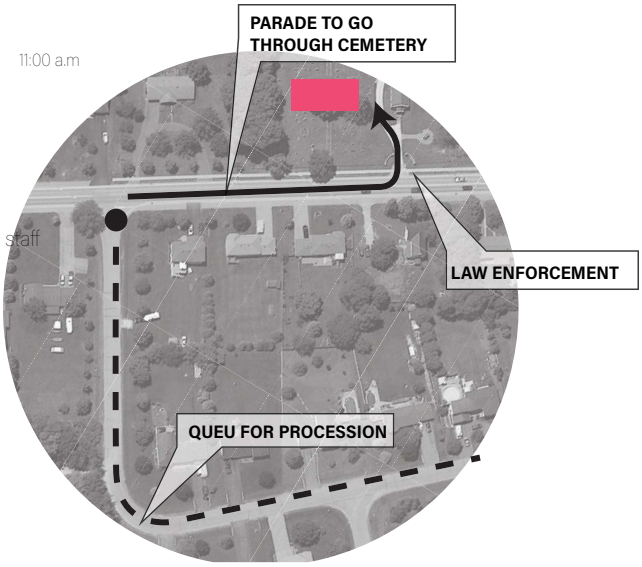


Fig 4-20 Illustration ofevents after commital

Our son's internment is scheduled for Wed, May 6 at 11:30 at Minesing Union Cemetery

Unfortunately, only 10 people are allowed to attend due to Covid-19.
1 of those people has to be the minister.

The family is asking that anyone who would like to be involved to please form a line OUTSIDE the cemetery and commence in a PARADE OF CARS through the cemetery AFTER the ceremony.

Cars should start lining up around 11:00 at Huron St and George Johnson St
The bylaws have asked that windows remain closed during the parade

☞ Cars should start lining up around 11:00 at Huron St and George Johnson St

☞ The bylaws have asked that windows remain closed during the parade 🙏

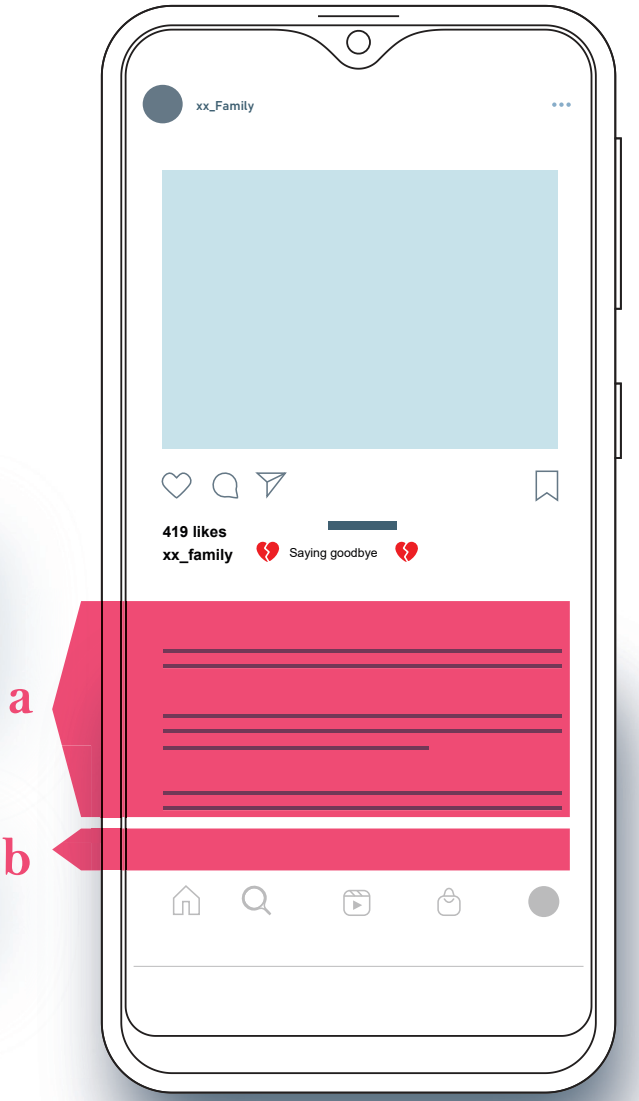
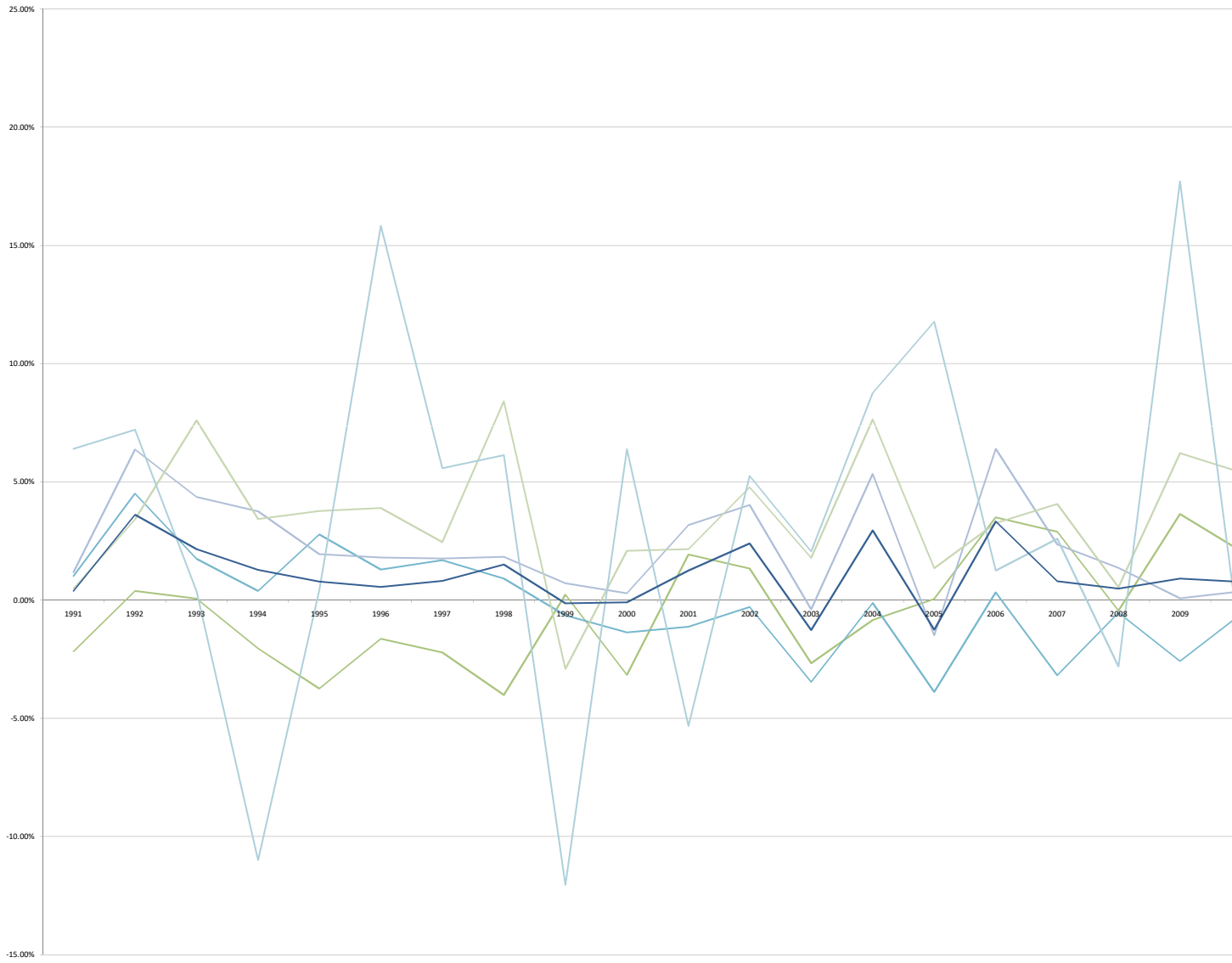


Fig 4-21 Illustration of procession details posted by Ramolla 's mother

THE NEXT ACUTE CRISIS

With the emergence of the digital age, a polycentric node of knowledge has allowed clinicians to share findings more readily and record patient files with less human error. Data sharing speed has also drastically increased due to the pandemic. The need for social distance has resulted in a live-work pattern in contrast to the centralized nine-to-five industrial model. As for medical PPE and resources, international bodies have employed mobile units to help on the front lines and supplement nations lacking in funding. At a national level, the United States currently holds the highest numbers of infections and fatalities and has previously set up a "temp task force" to be employed in higher-risk communities. And although Canada's efforts in flattening the curve are proving to be effective, the provision of a "temp unit" can be beneficial on the nation's agenda to alleviate stress at the provincial level. In addition, the predisposed psychosocial anxiety towards death has created a further divide between patient care and death care, as shown in the lack of resources, funding, and public oversight As 2023 slowly approaches and marking the fourth year of the global pandemic, ad-hoc solutions explored in this section are still prevalent in communities and likewise in Ontario. Though initially planned as temporary alternatives these adoptions may soon become permanent in our societies should initial capacities or concerns be addressed.



In the final section of Part 4, the upcoming crisis is introduced, as well as the multi-faceted problem of how current deathcare facilities must grow within the physical limitations of modern cities. At the national scale, Ontario and other Canadian provinces have yet to define a consolidated approach, and therefore other countries have been used as reference in investigating alternative methods to expanding current deathcare capacities. At the city scale, planners and architects will not only need to address impacts of urban sprawl but also phasing of institutions to accommodate flexible growth While the spatial restructuring of morgues has manifested in trailers, cooler trucks, and community facilities during the pandemic, the economic drive for morgue growth within hospitals is limited.

With the impermanent and flexible development of the deathcare sector, factoring resource capabilities and existing network infrastructure will rely heavily on the spatial analysis within region boundaries and repositioning opportunities. As noted during the programming crisis and more critically during the pandemic, there is an inherent need for expansion of current facilities. An unprecedented ratio of baby-boomers aging foreshadows the imminent incline of seniors in the demographic, patients seeking old age care, caseloads for death investigation units, and funeral services held. However, the problem is two-part as facilities will need to determine how to expand quickly, but also be able to scale down when the wave ends, and adjust as needed should birthrates continue at their existing decline.

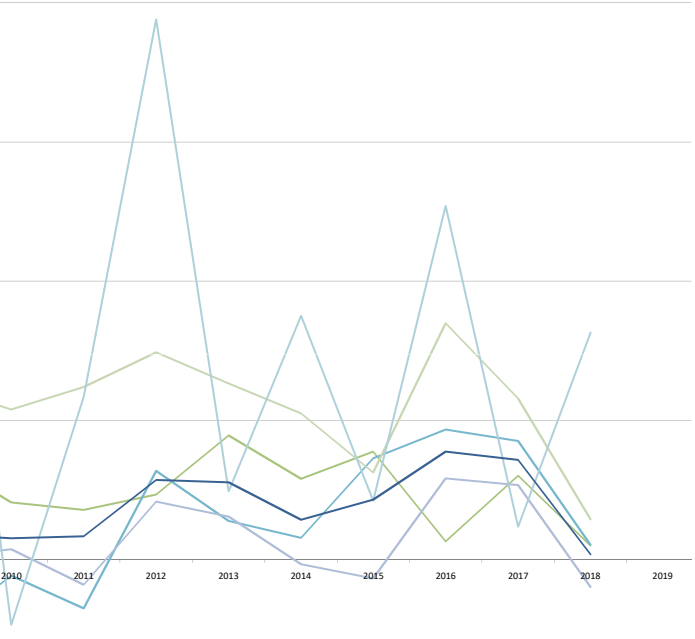


Fig 4-22 Growth chart of elderly population in Ontario

While the largest fluctuations are demonstrated by the 100 and over population, this is largely attributed to the advance in medicine. The second largest fluctuat, the 60 to 69 group, is therefore the leading demographic group with a rise since 2008 till present

60 to 69 change

70 to 79 change

80 to 89 change

90 to 99 change

100 and over change

Total deaths

Fig 4-23 Example of a columbarium in Hong Kong, SAR

PROPOSING NEW MODES OF MEMORIAL AND EXPANDING CURRENT CEMETERIES

In Volume 2 of 'The Early Works of John Dewey', Dewey builds on his theory of memory in relation to architecture and the role of aesthetics in religious associations.[42] The text presents architecture as the ideal creation of art as it appeals to not only the eye, as it occupies the three dimensions of space, but also to our touch and our muscular sense. Dewey further expands on the aesthetics of architecture, where its influence of powerful but vague emotions is akin to dependence and worship, and therefore, amongst the arts, especially fitting for sacred experiences. This is supported in his advocacy that the greatest architectural productions have always been temples and cathedrals and secondly, that high art allows artists more freedom in its creation, and is experienced in buildings of worship where there religious use triumphs any other especial end use. With the widespread trend of elaborate ceremonies and expensive burials, metropolitan cities are quickly developing and, in parallel, outgrowing their existing cemeteries. While smaller towns facing urban density obstacles, such as Hong Kong and Japan, have developed architectural interventions in vertical cemeteries, columbariums are still widely accepted burial typologies outside Asia.[43] In relation to memory, the activity of uniting various elements of experience creates a permanent self. The identification of self allows the mind to not only perceive the present world, but in doing so, unifies the various elements we encounter and how we are connected. As a global issue, the needs of aging baby boomers and the limited sites available in modern cities have been tackled by every discipline. Such explorations have lead to online services conducted via broadcast as explored in the previous chapter, to digital services where those deceased are memorialized through digital interactions. The Traveling Cloud Museum is an interactive map created by the Hart Island Project. It is a collection of stories of those who have been buried on Hart Island where by clicking on a plot number the user can access records of individuals. While each person has a clock measuring how long they have been buried, this is stopped when their anonymity is removed through restoring their history. Amongst these plots are those indicated in red where a person with AIDS has been identified.

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42 Butler, Colin. *"Morgue Trucks Might Be New but London's Capacity Issue Isn't, Say Funeral Directors."* CBC News, January 6, 2021. https://www.cbc.ca/news/canada/london/london-ontario-1.5862344.

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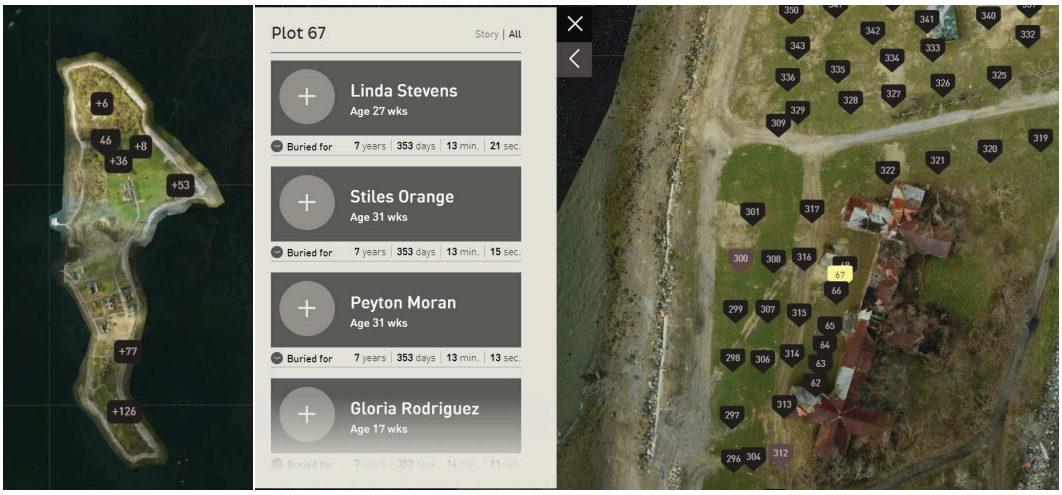


Fig 4-24 Screenshot of the interactive map (Travelling Cloud Museum)

TREND FOR GREENER DISPOSITION

Beyond the need to expand current spatial capacities, the results of current bereavement practices are not sustainable. While adaptation to existing practices may not be supported by all, an ecological alternative is available in the form of green burials. Hosted by TEDxGreenville, "Saving One Million Acres for Two Thousand Years" is presented by Dr. Billy Campbell,[44] a practicing physician from Westminster, South Carolina and founder of Memorial Ecosystems in 1966 and developed the world's first conservation burial ground, Ramsey Creek, in 1988.[45] The talk presents the upcoming global crisis where numbers of funerals will increase due to the baby Boomers and raises the significant economical costs associated. Where Americans spend 20 billion dollars per year on funerals, Dr Campbell suggests that in the next 25 years, less than 10% of this income could protect and restore more than 1 million acres of natural landscape and funding could be captured by conservation burial grounds. Although the prevalent choice remains to be cremation, he believes the shift to conversational burial grounds will not only provide a platform for end-of-life and land ethics education, but green space for communities facing unprecedented urban sprawl and fostering a lasting connection between humans and natural communities.

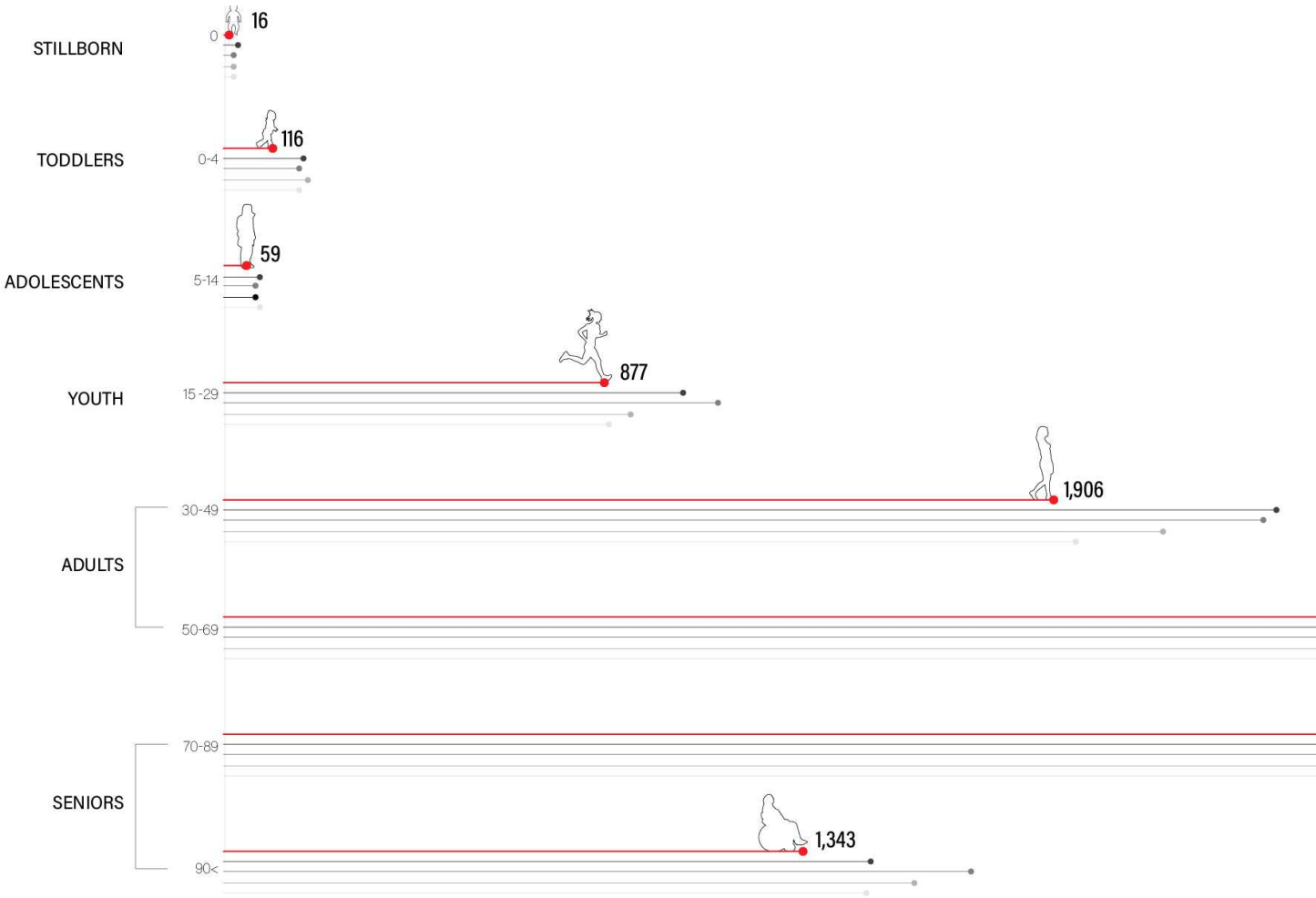
> *"According to Greensprings Natural Cemetery in New field, New York,the average US cemetery buries roughly 9,343liters of embalming fluid,219 tonnes of steel and 42,333 meters of high-quality wood used in caskets in a single hectare, whereas a body wrapped in a shroud or contained in a plain wood box decomposes quickly leaves behind a few pollutants and thus helps create new life"* [46]

44 Campbell, Billy. *"Saving One Million Acres for Two Thousand Years."* TEDxTalks, May 1, 2013. ttps:// www.youtube.com/ watch?v=OyA0VLzOPPA&feature=emb_logo.

45 *"The Travelling Cloud Museum."* The Hart Island Project, n.d. www.hartisland.net/.

46 McCausland, Janet. "Burial out of the box." Alternatives Journal, vol. 34, no. 1, Jan.-Feb. 2008, p. 6. Gale Academic OneFile, link.gale.com/apps/doc/A173407261/AONE?*u*=googlescholar&sid=bookmark-AONE&xid=9f365cd0.

CORONER AND MEDICAL EXAMINER INVESTIGATED DEATHS BY AGE GROUP
PROVINCE OF ONTARIO , 2015 2019



In Canada, there is a growing momentum in those seeking a greener disposition. Janet McClausland, the current director of the Natural Burial Association and Head of Programs at Prince's Trust Canad credits this trend in Victoria BC to its residents' acceptance of the idea and understanding of the environmental impacts of traditional burials. [47] Embalming is a large source of pollutants due to the formaldehyde, methanol and ethanol used to replace body fluids and with the highest rate of cremations in North America, Stephen Olsen, the executive director of Royal Oak Burial Park, Victoria, expects that potential clients may be considering the environmental impacts of the fossil fuel consumption. While Ontario offers 'hybrid' natural burial options, where sectioned green burial areas are designated in cemeteries, the practice has not been as widely accepted by residents. To promote more green practices and to distance from existing norms, government incentives and actionable guidelines may be required to help facilities transition to this alternate business model, both financially and logistically.

47 McCausland, Janet. *"Burial Out of the Box."* ProQuest. Alternatives Journal, 2008. https://www.proquest.com/openview/c732e61b8fe33ce5812365044c82e43c/1?pq-origsite=gscholar&cbl=35934.

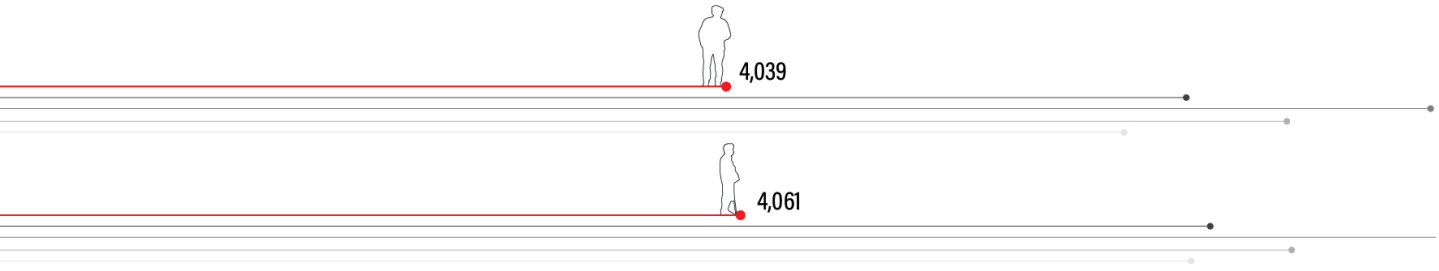


Fig 4-25 Diagram of Coroner and Medical Examiner Investigated Deaths by Age Group from 2015 to 2019 in Ontario

As demonstrted from the graph, the demographic that has the most autopsies is the 50 to 69 and the 70 to 89 age group. While many are attributed to health reasons, a disproportionate amount of resources have been dedicated by the death investigation sector which could perhaps be alleviated with calrification in patient information

ADDRESSING THE SPATIAL AND ORGANIZATIONAL LIMITATIONS OF CURRENT SECTORS

The juxtaposing concerns of demographics have led to a disproportionate allocation of hospital resources, where seniors, who comprise 17% of the population, represent 34% of hospital cases and 58% of hospital days. Ensuring patient care services will remain and reflect what is available today, the patient care sector will need to double existing capacities by 2035, which is not feasible. To better confront this challenge, the Canadian Institute for Health Information proposes a re-evaluation of services and beds dedicated to seniors in transition in order to harness existing capacities and match health services to those in need.

Example:

In a health system with 30,000 residential care beds and an average length of stay of 20 months, by reducing each new client's length of stay by just one month, the system could serve nearly 1,000 more people within the existing capacity.

In an interview with Ahmed Samarji, Associate Professor of Forensic Science Education & STEM Education and the Assistant Dean of the College of Arts and Sciences, Phoenicia University, is part of a series of dispatches from clinicians and researchers operating on the front lines of the coronavirus pandemic. The role of forensic pathologists, like Samarji, is to integrate law and medicine to determine the cause, mechanism, manner and time of a person's death and their role in pandemics is in manging the crisis, either locally or as part of a humanitarian mission abroad. Their tasks involve the proper management of dead bodies, guiding authorities and minimizing the spread of the virus. In response to the digging of mass graves in New York City and Ecuador, Samarji emphasizes the need for swift action as national plans are often exhausted in the management of bodies and can lead to infections across the community.[48] As such, government have very limited, yet essential, choices to make and he proposes that certification of medical deaths due to COVID-19 be allowed by treating clinicians, without the need for a post mortem examination, and also to establish temporary mortuaries able to accommodate the flux of burials under the guidelines of international humanitarian law.

For the forensic community working in war zones or refugee camps, Samarji list the basics pathologist need: appropriate storage, personal protective equipment, basic dissection tools and specimen collection material. However, since their work falls within a larger chain of events, "hospitals must have the capacity to identify the person, determine their cause of death, physically dispose of the body and work through the various legal complexities that these cases attract – and to do so swiftly." The interview with Samarji provides a chilling first hand account of the professionals who risk their lives on the front lines. The lessons learned and recommendations provided all seem well meaning but is conflicted by ambiguous and dated humanitarian laws. While pandemic caseloads in New York far exceeded those in Toronto, the deathcare system in both cities have historically been under pressures due to spatial constraints of morgue capacities.

Fig 4-26 Temporary erected in 2020 at New York City's Wyckoff Hospital

Bodies are moved to a refrigerated truck serving as a temporary morgue for Wyckoff Hospital, Brooklyn, April 4, 2020 in New York City, where someone dies from COVID-19 every few minutes. (credit to SMITH, BRYAN R. Getty Images, April 4, 2020)

48 Samarji, Ahmad. *"Overloaded Morgues, Mass Graves and Infectious Remains: How Forensic Pathologists Handle the Coronavirus Dead."* The Conversation, April 8, 2020. theconversation.com/overloaded-morgues-mass-graves-and-infectious-remains-how-forensic-pathologists-handle-the-coronavirus-dead-135275.

CONCLUDING REMARKS

Overlooked and underfunded, the Toronto deathcare system is entwined in thehealthcare sector's economic, socio-political, physical/architectural, and legal complications. Existing hospital master plans arefocused on the expansion of wings and ICU bed counts and justified through the financial prospects of patient care facilities over mortuaries.With funeral costs averaging $10,000, private death care is a luxury not all families can afford and compounds the need for morgue expansion, with coroners noting a rapidly growing trend of unclaimed bodies throughout Ontario. While temporary morgues and mass graves may provide solace for immediate capacity flux, the underlying issue of low morgue capacities is a national problem that will need to be addressed due to baby boomer life expectancy. Understanding the deathcare system as a precarious ecosystem comprised of varying stakeholders and conflicting interests will inform the need to reform institution structures, catalyst in power struggles between province and regions, and enable synnergy between agencies and disciplines.

The complexity of deathcare and healthcare design cannot be contested and has generated countless new interdisciplinary partnerships since the pandemic. This is seen in prefab morgues and hospitals' engineering feats, human resource tools in trace detection, municipal coordination for arena and park repositioning, and the monetary and resource donations from various fields. While these partnerships have been instrumental in the nation's response to the pandemic, they have also opened new possibilities for cross-discipline interaction and synergy such as the sharing of datasets between institutions and governments and the leverage of resources and units between healthcare practitioners, researchers and individual businesses. In synthesizing engineering and economy, an integrated social agency can alleviate complex problems and spread risk across a more lateral network of professional liabilities.

As a handbook, Beyond Utility aims to clarify the otherwise unseen operations of the deathcare industry. This handbook seeks to consolidate and abbreviate industry-specific guides, government policies, and journal reports into a visual guide and allow readers to determine if current provisions and resources are adequate independently. Temporary solutions to deathcare challenge the dignified handling of remains, the safety of its workers, and the accuracy of reporting in expedited examinations. While case studies of ad-hoc solutions will demonstrate the efficiencies of temporary constructions in dead body management, adapting in response to MFI's is costly. With the impending wave of aging baby boomers by 2030, there is an immediate need for facility capacity expansion. Still furthermore, the lack of adaptability in existing facilities remains a more significant planning issue. With expectations of fertility rates to continue declining, the need to address rapid growth must also anticipate the unprecedented decline in demand shortly after. The erection of remote sites or over sizing of mechanical systems is a possible solution for managing growing markets. Still, without adaptability for alternative programs, they are costly temporary solutions and rendered redundant in the needs of a future deathcare system. Therefore, a permanent solution will only be viable if stakeholders make a concerned effort to address exist concerns and furthermore, for typologies to be adaptable as service demands change in response to declining populations.

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